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SUPPLEMENTAL VOLUMES

TO THE

WORKS

OF

SIR WILLIAM JONES.

CONTAINING THE WHOLE OF THE

ASIATICK RESEARCHES

HITHERTO PUBLISHED,

EXCEPTING THOSE PAPERS ALREADY INSERTED IN HIS WORKS.

VOL. I.

LONDON:
PRINTED FOR G. G. AND J. ROBINSON, PATERNOSTER-ROW;
AND R. H. EVANS, PALLMALL.

1801.

[*T. Davison, Lombard-street, White-friars.*]



ADVERTISEMENT.

THE confideration of Sir WILLIAM JONES, as a man of Genius, his uncommon proficience in general learning, and his unrivalled attainments in the learning of the Eaft, having unitedly called for an Edition of his Works, thefe Volumes are added to make them complete.

The PUBLICK need not be told, that to him the ASIATICK SOCIETY owes its exiftence; and, as it was conftituted under his aufpices, fo, to his fuperintendance it is indebted for the celebrity it now enjoys, and the incalculable advantages it cannot fail to confer. Exclufively of the Papers which were delivered by the PRESIDENT in it, there is more than reafon to fuppofe, many others were indebted to his pen; and as the greateft part of thefe papers were produced whilft he continued to prefide, they in a fpecial manner are appropriate to him. At leaft, thus far they certainly are, as afcertaining the extent which he witneffed of his own inftitution, and what it drew from his influence and perfonal exertions, in conjunction with the Members who placed him at their head.

Under this impreffion, the Purchafers of the Works of this ineftimable Man, will confider the fubfequent Volumes as a neceffary Addition.

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INTRO-

THE

INTRODUCTION.

If this first Publication of the Asiatick Society *should not answer those expectations which may have been hastily formed by the learned in* Europe, *they will be candid enough to consider the disadvantages which must naturally have attended its institution, and retarded its progress. A mere man of letters, retired from the world, and allotting his whole time to philosophical or literary pursuits, is a character unknown among* Europeans *resident in* India, *where every individual is a man of business in the civil or military state, and constantly occupied either in the affairs of government, in the administration of justice, in some department of revenue or commerce, or in one of the liberal professions. Very few hours, therefore, in the day or night, can be reserved for any study, that has no immediate connection with business, even by those who are most habituated to mental application: and it is impossible to preserve health in* Bengal *without regular exercise and seasonable relaxation of mind; not to insist that, in the opinion of an illustrious* Roman, *"No one can be said "to enjoy liberty, who has not sometimes the privilege of doing nothing." All employments, however, in all countries, afford some intervals of leisure; and there is an active spirit in* European *minds, which no climate, or situation in life, can wholly repress, which justifies the ancient notion, that* a change of toil is a species of repose; *and which seems to consider nothing done or learned, while any thing remains unperformed or unknown. Several* Englishmen, *therefore, who resided in a country, every part of which abounds in objects of curious and useful speculation, concurred in opinion, that a Society instituted at* Calcutta, *on the plan of those established in the principal cities of* Europe, *might possibly be the means of concentrating all the valuable knowledge*

knowledge which might occaſionally be attained in Aſia ; *or of preſerving at leaſt many little tracts and eſſays, the writers of which might not think them of ſufficient importance for ſeparate publication. The* Asiatick Society *was accordingly formed on the* 15*th of* January, 1784, *by thoſe Gentlemen whoſe names are diſtinguiſhed by aſteriſks in the Liſt of Members at the end of this Book ; and ample materials have already been collected for two large volumes on a variety of new and intereſting ſubjects. By this* Publication *the Inſtitution may be conſidered as having taken root: but the plant will flouriſh or fade, according as the activity or remiſſneſs of the Members and their correſpondents ſhall promote or obſtruct its growth. It will flouriſh, if naturaliſts, chymiſts, antiquaries, philologers, and men of ſcience, in different parts of* Aſia, *will commit their obſervations to writing, and ſend them to the Preſident or the Secretary at* Calcutta ; *it will languiſh, if ſuch communications ſhall be long intermitted ; and it will die away, if they ſhall entirely ceaſe : for it is morally impoſſible that a few men, whatever be their zeal, who have great publick duties to diſcharge, and difficult private ſtudies connected with thoſe duties, can ſupport ſuch an eſtabliſhment without the moſt aſſiduous and eager auxiliaries.*

Before we proceed to give a ſhort hiſtory of the inſtitution, it may be proper to declare, that the Society will paſs no deciſion, in their collective *capacity, on any point of literature or philoſophy ; but that the writers of ſuch diſſertations, as they ſhall think worthy to be publiſhed from time to time, muſt hold themſelves individually reſponſible for their own opinions ; a declaration which is conformable, we believe, to the practice of ſimilar Societies in* Europe.

It having been reſolved to follow, as nearly as poſſible, the plan of the Royal Society *at* London, *of which the* King *is* Patron, *it was agreed, at the firſt regular meeting, that the Letter here exhibited ſhould be ſent to the Governor General and Council, as the* Executive Power *in the Company's territories: and their anſwer, which is alſo ſubjoined, was received in the courſe of the next month.*

TO

TO THE

HONOURABLE WARREN HASTINGS, ESQUIRE,

Governor General, Prefident ;

EDWARD WHELER, JOHN MACPHERSON,

AND JOHN STABLES, ESQUIRES,

Members of the Council of FORT WILLIAM *in* BENGAL.

HONOURABLE SIR AND GENTLEMEN,

A SOCIETY, of which we are members, having been inftituted for the purpofe of enquiring into the Hiftory, civil and natural, the Antiquities, Arts, Sciences, and Literature of *Afia*, we are defirous that you will honour us with accepting the title of our *Patrons*, and requeft you to confider this application as a token of the great refpect with which we are,

Honourable Sir and Gentlemen,

Your moft obedient,

And moft humble fervants,

JOHN HYDE,
WILLIAM JONES,
JOHN CARNAC,
DAVID ANDERSON,
WILLIAM CHAMBERS,
FRANCIS GLADWIN,
JONATHAN DUNCAN,
THOMAS LAW,
CHARLES WILKINS,
JOHN DAVID PATERSON,
CHARLES CHAPMAN,
CHARLES HAMILTON,
GEORGE HILARO BARLOW.

Calcutta, Jan. 22, 1784.

THE ANSWER.

GENTLEMEN,

WE very much approve and applaud your endeavours to promote the extenſion of knowledge by the means which your local advantages afford you in a degree, perhaps, exceeding thoſe of any part of the *globe* ; and we derive great hopes of your attainment of ſo important an end, from our perſonal knowledge of the abilities and talents of the Gentlemen whoſe names we read in the ſubſcription to your addreſs.

We accept the title you have been deſirous of conferring upon us of *Patrons* to your Society, and ſhall be happy to avail ourſelves of any occaſion that may occur of contributing to its ſucceſs.

We are, Gentlemen,

Your moſt obedient humble ſervants,

WARREN HASTINGS,
EDWARD WHELER,
JOHN MACPHERSON,
JOHN STABLES.

MR. HASTINGS *therefore appeared, as Governor General, among the Patrons of the new Society ; but he ſeemed, in his private ſtation, as the firſt liberal promoter of uſeful knowledge in* Bengal, *and, eſpecially as the great encourager*

courager of Perſian *and* Sanſcrit *literature, to deſerve a particular mark of diſtinction; and he was accordingly requeſted, in a ſhort letter, to accept the title of* Preſident. *It was, indeed, much doubted whether he would accept any office, the duties of which he could not have leiſure to fulfil; but an offer of the honorary title was intended as a tribute of reſpect, which the occaſion ſeemed to demand, and which could not have been omitted without an appearance of inattention to his diſtinguiſhed merit. His anſwer is alſo annexed.*

GENTLEMEN,

I AM highly ſenſible of the honour which you have been pleaſed to confer upon me, in nominating me to be the Preſident of your Society; and I hope you will both admit and approve the motives which impel me to decline it.

From an early conviction of the utility of the inſtitution, it was my anxious wiſh that I might be, by whatever means, inſtrumental in promoting the ſucceſs of it; but not in the mode which you have propoſed, which, I fear, would rather prove, if of any effect, an incumbrance on it.

I have not the leiſure requiſite to diſcharge the functions of ſuch a ſtation: nor, if I did poſſeſs it, would it be conſiſtent with the pride which every man may be allowed to avow in the purſuit or ſupport of the objects of his perſonal credit, to accept the firſt ſtation in a department, in which the ſuperior talents of my immediate followers in it would ſhine with a luſtre, from which mine muſt ſuffer much in the compariſon; and to ſtand in ſo conſpicuous a point of view the only ineffective member of a body which is yet in its infancy, and compoſed of members with whoſe abilities I am, and have long been, in the habits of intimate communication, and know them to be all eminently qualified to fill their reſpective parts in it.

On

On thefe grounds I requeft your permiffion to decline the offer which you have done me the honour to make to me, and to yield my pretenfions to the Gentleman whofe genius planned the inftitution, and is moft capable of conducting it to the attainment of the great and fplendid purpofes of its formation.

I, at the fame time, earneftly folicit your acceptance of fervices in any way in which they can be, and I hope that they may be, rendered ufeful to your refearches.

I have the honour to be, Gentlemen,

Your moft obedient,

And moft humble fervant,

Fort William, WARREN HASTINGS.
Jan. 30, 1784.

On the receipt of this letter, SIR WILLIAM JONES *was nominated Prefident of the Society; and, at their next meeting, he delivered the following Difcourfe:*

A DISCOURSE ON THE INSTITUTION OF A SOCIETY FOR INQUIRING INTO THE HISTORY, CIVIL AND NATURAL, THE ANTIQUITIES, ARTS, SCIENCES, AND LITERATURE OF ASIA. *See the Works of Sir William Jones, Vol. I. p. 1.*

I.

A DISSERTATION ON THE ORTHOGRAPHY OF ASIATICK WORDS IN ROMAN LETTERS.

See the Works of Sir William Jones, Vol. I. p. 175.

II.

ASTRONOMICAL OBSERVATIONS IN FORT WILLIAM, AND BETWEEN MADRAS AND CALCUTTA;

BY *COLONEL THOMAS D. PEARSE,*

Commandant of the Artillery, and Second in Command of the Bengal Army.

I BEG leave to communicate to the Society ſome aſtronomical obſervations which I made at different times in *Fort William.*

The clock I uſed from December, 1775, was made by Ellicot: it beats dead ſeconds: there is one hand for minutes, and the hours revolve with the plate fixed to the hour wheel.

The pendulum can be lengthened, without ſtopping the clock, by means of a ſcrew, which ſupports the ſpring by which the pendulum hangs. And the pendulum is deſcribed in the 47th volume of the Philoſophical Tranſactions, p. 479. The clock-caſe is firmly ſcrewed to the wall. The tranſit inſtrument was made by SISSON; it is four feet long, and has a double object glaſs. This is ſupported by two iron bars, which are joined to a ſquare frame, that lies two feet under the floor, buried in brick work.

The upright bars are protected by a caſe of wood, which is fixed to the houſe, without touching them in any part.

At firſt I uſed the cornice of the Commandant's houſe to adjuſt by; but afterwards a ſlider, with a ſlit in it, was put up in the area of the fort, near the ſame place, behind which I could place a light to adjuſt with by night. There was another object alſo to the ſouth, about 1500 yards off, which I could uſe by day; and both theſe were fixed when the tranſits by teleſcope, and equal altitudes agreed, and were examined from time to time.

I had

I had only a tolerably good HADLEY's quadrant and quickfilver, till December, 1776, when I was lucky enough to get an 18 inch land quadrant, made by RAMSDEN, with a micrometer, to fubdivide the nonius. This inverts, and is capable of the niceft adjuftments. My firft telefcope was an 18 inch reflector, made by GREGORY.

In Auguft, 1777, I obtained Mr. SMITH's refractor, made by DOLLAND, with a triple object glafs, and a double object glafs micrometer. And I made a polar axis for it of brafs with rack work, and a declination circle not divided, which alfo is racked; to which, when the micrometer was ufed, the telefcope was fixed.

I likewife communicate obfervations made by myfelf chiefly, and by Lieutenant COLEBROKE for me, to afcertain the longitudes and latitudes of places between *Madras* and *Calcutta*.

Going to *Madras* in 1782, I ufed an HADLEY's octant and quickfilver, which I fhall here defcribe.

The octant had a wooden index. I feparated the part which carries the fpeculum from the arm; then fixed it into a lathe, and turned it on its own centre: it was three-tenths of an inch thick; the thicknefs was divided into three parts, and then the edge was turned away on each fide; fo that the whole piece of wood became like three wheels of different diameters joined together on their flat furfaces, and the middle one was the biggeft; that below was the next in fize; and the upper one was the leaft, and only equal to the brafs plate on which the fpeculum was fcrewed.

A plate of brafs, nearly one-tenth thick, broad enough to admit of a hole as big as the under circular part of the turned wood, and to afford a rim of half an inch broad, was then fixed into the lath, and had a hole turned in it of that fize: on one fide it had an arm as broad as the wooden index was.

A fecond plate of the fame kind was alfo prepared; but the hole was larger, though lefs than the middle part of the turned wood.

The turned piece was then fixed to the octant by its pin, and the plate with the fmaller hole beneath it. As they fitted very nicely, the brafs plate turned upon the wood round the centre of the octant, if that were held faft; and both turned on the centre pin if they were preffed together.

The plate with the large hole was then laid above the turned wood, its centre coinciding with the common centre: the wooden arm of the index had the end neareft the centre cut away, above and below, equal to the thicknefs of the plates of

of braſs: it was there fixed to the octant in the ſame manner as before it was cut off from the centre, and the braſs plates were drilled and rivetted to it.

When theſe plates were preſſed together, they held the turned piece as it were in a vice; when they were forced aſunder, the turned piece might be moved independently; and there were in the direction of the radius two ſcrews, one beyond the ſpeculum, and one between it and the nonius, for the purpoſe: they had button heads, and their ſhanks were as high as the top of the index ſpeculum.

On the back of the octant there was a ſcrew with a button head; the thread entered the centre pin, and the ſhoulder preſſed upon the plate which keeps that pin in its place.

The back ſcrew and vice ſcrews being ſlacked, the index ſpeculum was brought parallel to the horizon glaſs; then the vice ſcrews were turned to join the ſpeculum to the index, as before the alteration was made.

To extend the power of the octant occaſionally, it was nicely adjuſted: then the index was carried to 90°, and there ſcrewed to the limb. Next the back ſcrew of the centre pin was forced, till by its preſſure the ſpeculum piece was held faſt: after that, the vice ſcrews being ſlacked, the index was carried back to 0°, and there ſcrewed to the limb. Whilſt it was in this poſition, the vice ſcrews were again turned, which fixed the ſpeculum piece to the index, and then the back ſcrew being ſlacked, the ſpeculum followed its motions. When it was uſed, the index ſhewed the angle which was to be added to 90° for the angular diſtance.

By this contrivance, with an octant, I could take angles of 150°; and conſequently meridian altitudes as far as 75°: and if the horizon glaſs and teleſcope could have been made to ſlide nearer towards the centre, it would have been increaſed ſtill further.

In RAMSDEN's new quadrant there is a ſcrew to adjuſt the horizon glaſs, and bring it parallel to the other: provided the index ſpeculum is perpendicular to the limb, this is all well; but if that be inclined, as ſoon as the index quits 0°, there will be an error in the angles obſerved. I found it ſo experimentally, and corrected my quadrants accordingly, by turning the horizon glaſs round its own axis; then, having adjuſted as uſual, the error ſide-ways was corrected by moving both glaſſes, by means of their adjuſting ſcrews, and dividing the error between them. If, when the horizon glaſs was reſtored to its proper poſition, there ſtill was a lateral error, the operation was repeated. I do not find any mention of this in any of the inſtructions for uſing HADLEY's inſtruments that I have ſeen.

The horizon was artificial, invented for the occaſion, and conſiſted of a wooden

trough about half inch deep (or rather more), filled nearly with quickſilver, which ſerved to float a plate of thick glaſs, the under ſurface of which had been unpoliſhed and blacked, that only one image might appear. This needs not any adjuſtment: the only requiſite is, that the glaſs be equally thick all over, and ſmooth : that which was uſed was a part of a very large looking glaſs, that had been broken by accident.

The watch was a time-keeper, by BROOKBANK, which goes whilſt it is wound up, and is tolerably good, conſidered as a ſale watch ſent to *India*.

The teleſcope had a double object glaſs, with a braſs ſtand, and was made by GREGORY: it magnifies 80 times, but, like all of this conſtruction, that I have ſeen, it had a dark ſpeck in the middle, and was not equally good in the whole field.

In the way back, we had a land quadrant, of 15 inches radius, made by B. MARTIN, and ſent out by the *India* Company. It was uſed by Mr. HURST in the tranſit of *Venus*. This could not be inverted. But, to deſtroy the effects of collimation, and error of level, the latitudes are all determined by ſtars taken north and ſouth of each place, as the obſervations will ſhew.

JUPITER's FIRST SATELLITE.

IMMERSIONS.

Date.	*Apparent time Correct.* H. M. S.	*Time by Ephemeris.* H. M. S.	*Longitude.* H. M. S.	
1774, 14th Oct.	12.32.25	6.39.00	5.53.25	*Jupiter* very nearly vertical, and the glaſs ſhook much.
23d do.	8.57.15	3.03.17	5.53.58	
1776, 13th Nov.	13.58.56,3	8.04.46	5.54.10,3	
29th	12.09.39	6.15.53	5.53.46	
6th Dec.	14.00.32,6	8.06.38	5.53.54,6	
13th.	15.50.59,3	9.57.02	5.53.57,3	
15th.	10.18.31	4.24.35	5.53.56	
22d.	12.08.47,6	6.14.50	5.53.57,6	
31ſt.	8.26.54,1	2.32.49	5.54.05,1	
1777, 16th Jan.	8.51.19,6	2.57.11	5.54.08,6	
27th Dec.	9.38.58,8	3.45.01	5.53.57,8	*Dollond*'s triple object glaſs.
EMERSIONS.				
1774, 29th Dec.	11.25.47	5.31.52	5.53.45	
1777, 30th Jan.	12.36.11,8	6.42.30	5.53.41,8	
1778, 15th March.	8.40.49,6	2.47.41	5.53.08,6	*Dollond*'s triple object glaſs.
7th April.	9.00.02,2	3.07.00	5.53.02,2	Ditto.
14th.	10.56.35,1	5.03.30	5.53.05,1	Ditto.
1779, 3d May.	12.07.38,8	6.14.37	5.53.01,8	Ditto.

SECOND

SECOND SATELLITE.

IMMERSIONS.

Date.	Apparent time Correct. H. M. S.	Time by Ephemeris. H. M. S.	Longitude. H. M. S.	
1776, 4th Dec.	10.53.23,5	4.58.08	5.55.21,5	
11th.	13.25.50,4	7.30.42	5.55.08,4	
18th.	15.58.21	10.03.14	5.55.07,0	
29th.	7.48.01,4	1.52.27	5.55.34,4	
1780, 11th July.	9.34.17,3	3.41.33		Emerged from behind the body 9.27.04,3, and was quite clear of the body at 9.28.55,3. *Dollond*'s triple object glass.

EMERSIONS.

Date.	Apparent time Correct.	Time by Ephemeris.	Longitude.	
1775, 29th Dec.	8.47.41,7	2.53.18	5.54.23,7	
1777, 23d Jan.	7.32.44,3	1.37.41	5.55.03,3	
29th April.	7.20.34,1	1.25.43	5.54.51,1	
6th May.	9.59.28,9	4.04.11	5.55.17,9	
1779, 8th May.	11,45,53,5	5.52.13	5.53.40,5	Here the tables seem to have been corrected. *Dollond*'s triple object glass.

THIRD SATELLITE.

Date.	Apparent time Correct.	Time by Ephemeris.		
1774, 10th Nov.	13.12.30	7.18.17	Emersion.	
1775, 28th Jan.	7.28.58,5	1.33.45	Immersion.	
	9.04.20	3.07.49	Emersion.	But I thought I saw it about a minute before; however, it was so very dim that I cannot be certain.
1776, 3d Nov.	10.55.20,2	5.00.14	Emersion.	
17th.	15.31.51,3	9.42.37	Immersion.	
23d Dec.	11.10.33,6	5.19.58	Immersion.	
1777, 28th Jan.	10.13.13,2	4.22,53	Emersion.	
1778, 3d April.	9.21.24,9	3.33.12	Do.	I think I might have seen it earlier if I had expected it to emerge at a greater distance than one Satellite appeared, which was the case. *Dollond*'s triple object glass.
1779, 2d May.	8.44.37,5	2.54.27	Immersion.	Rather doubtful.
	45.26,5			I thought I saw it, but *Jupiter* was so very bright it dazzled my eyes.
	11.32.80,6	5.44.27	Emersion.	

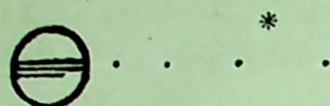
FOURTH SATELLITE.

Date.	Apparent time Correct.	Time by Ephemeris.		
1776, 2d Nov.	13.23.14,0		Emersion.	
1777, 8th Jan.	9.28.49,5		Immersion.	
25th.	7.23.02,0		Emersion.	At the time of this observation, there was a very small star a very little to the west of the western Satellite.
1778, 9th May.	8.25.13,0		Emersion.	*Dollond*'s triple object glass.

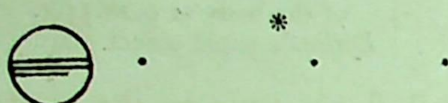
Other

Other Obſervations of Jupiter *and his Satellites.*

1776, 22d November, between 9 and 10, I ſaw a very ſmall ſtar, not bigger than a Satellite, very near to *Jupiter.* The configuration thus,



At 12^h.9$'$.39$''$ the configuration was thus,

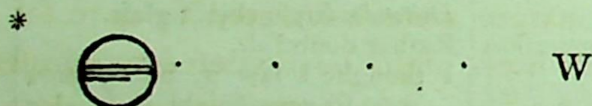


that is, the two outermoſt Satellites had gone forward, and *Jupiter* back, in right aſcenſion, viſibly.

30th November, the configuration was thus,



that is, the ſtar was north; diſtant from the limb in declination about the quantity of the leſſer axis. In right aſcenſion the ſtar was advanced further than *Jupiter*'s centre, about a fifth of the axis. Some time after I found that the little Satellite, which was below the limb, had immerged into the diſk; and ſoon after I ſaw the ſhadow of that Satellite upon the Great Belt. I obſerved the ſhadow go off the diſk; and about an hour after that, the Satellite emerged a little to the north of the Great Belt. The times were noted, but the book was deſtroyed by accident. When *Jupiter* paſſed the meridian, I could not ſee the ſtar in the tranſit teleſcope; but about 4$'$ afterwards the configuration was thus,



that is, a line drawn from the ſtar to *Jupiter*'s centre, made an angle with the Great Belt, which I judged to be about 41°; and in that direction it was about the quantity of the leſſer axis diſtant from the limb; ſo that *Jupiter* had moved back about $\frac{3}{4}$ of his diameter from the time I firſt ſaw him to-night till he paſſed the meridian.

1776, 8th December, my clock was ſtopped by an earthquake, which ſpoilt the obſervation of the immerſion of *Jupiter*'s firſt Satellite.

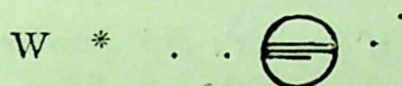
1776,

1776, 23d *December, an Emerſion of the firſt Satellite from the Diſk.*

	Apparent Time correct.
	h ′ ″
The ſhadow touched the middle of the edge of the Great Belt, and made a viſible notch in it - - - - -	11.26.00
It was ſtill viſible - - - - - - - - -	28.05
It vaniſhed - - - - - - - - - -	30.50
Satellite at the edge of the limb - - - - - - -	53.25
In contact emerged - - - - - - - - -	58.53

1777, 25th January, $7^h.23'.00''$,6, I ſaw a ſmall ſtar a little to the weſt of the weſtermoſt Satellite, not ſo bright as either of them; it was hardly viſible through the reflector.

Configuration thus,



26th, I could not find the ſtar at $7^h.11'$.

29th May, *Jupiter*'s ſecond Satellite immerged behind the diſk - $7^h.25'.18''$,7

1779, 2d *May, an Immerſion of* Jupiter'*s firſt Satellite into the Diſk.*

	Apparent Time correct.
	h ′ ″
In contact - - - - - - - - - -	11.31.37,6
Immerſion doubtful - - - - - - - -	35.19,6
certain - - - - - - - -	35.50,6

If the immerſions and emerſions of this nature were calculated ſo as to ſet aſtronomers to look out for them, *Jupiter*'s Satellites might be rendered more uſeful than they now are in regard to longitudes by land; and that too, whether the calculations are accurate or erroneous.

For I mean to uſe an immerſion or emerſion of any kind, only to note an inſtant for taking the altitude of *Jupiter* at the place of obſervation.

If the inſtruments be of equal powers, and the eyes of equal ſtrength, then certainly the altitudes will be taken by every perſon, who ſhall obſerve the ſame phenomenon at one and the ſame inſtant of time; and thence the diſtance of *Jupiter* from

from the meridian of each will be known to ſeconds, if we ſuppoſe the latitudes known beforehand.

And if the teleſcopes of quadrants could be made ſufficiently powerful to obſerve the Satellites, then a ſingle obſerver, at any place, could perform the whole without trouble or difficulty, and would only need a common watch, and a little more patience than would be requiſite if the watch were perfect, and calculation true.

But ſuppoſing the teleſcopes and quadrants as they are, and two obſervers at each place, one employed with the Satellite, and the other with the quadrant, then the latter muſt carefully keep the body of *Jupiter* on the line of altitude till the other tells him to ſtop, which is to be done at the inſtant of obſerving the expected phenomenon.

By this mode a degree of longitude may be meaſured with as much accuracy as a degree of latitude ; and it is what I have in contemplation to perform, as ſoon as I can get the requiſite inſtruments.

Remarks on ſome erroneous Obſervations of Jupiter*'s firſt Satellite.*

In 1778 I took notice, that when *Jupiter* is very near the oppoſition, the obſervations are not to be depended on, and that the Satellite vaniſhed without changing colour. The ſame happened in 1779, 1780, and again in 1784, at *Beemulwilſa* ; therefore I have put down the times of ſuch obſervations, as they are reduced to apparent time, from the known deviation of the clock from mean time. The tranſit inſtrument was examined by ſtars that paſs over the zenith, and by others north and ſouth, and by equal altitudes ; all which ſhewed it was as nicely in the meridian as it well could be.

In 1779, on the 3d of March, I obſerved η and μ Geminorum, and the deviation was the ſame as that derived from the tranſits of the ſun on the 23d February, and 5th March. In the obſervation of the moon 23d November following, the accuracy of its poſition was aſcertained, ſo that the times were correct ; and the errors depend on ſomething at the ſatellite and planet. Perhaps *Jupiter*'s atmoſphere may be ſo denſe as to prevent the free paſſage of the diminiſhed light ſoon after the beginning of an eclipſe, or even before it. If ſo, theſe obſervations may tend to clear up that point, and to meaſure the extent of that atmoſphere.

Date.

Date.	Apparent time Correct. H. M. S.	Ephemeris. H. M. S	
1778, 4th Feb.	7.51.10,3	1.58.08	
1779, 23d do.	9.02.51,0	3.10.01	
2d March.	10.58.15	5.05.17	
9th do.	12.53.08	7.01.07	These two were obferved at *Dumdum*, but the time was taken from the tranfit inftrument by a watch, carried out before and back after, and compared with the clock.
11th do.	7.20.35,3	1.30.10	
1780, 13th March.	10.10.47,7	4.20.23	

All thefe obfervations were made with *Dollond*'s triple object glafs.

Obfervations of Venus.

1776, 2d January, at $7^h.55'$, in the morning, I meafured the diftance between *Venus* and the *Sun* $46^\circ.32'$.

I was informed the natives were viewing it with aftonifhment, but I did not fee it with the naked eye. Through the little telefcope of my HADLEY's quadrant it appeared as bright as *Capilla*.

	Apparent time correct. h ′ ″
1777, 1ft July, *Venus* paffed the meridian - - - - -	21.30.41,5
14th, *Venus* vifible to the naked eye, and has been fo three days	
Paffed the meridian - - - - - - - -	21.01.02,0

Diftances from the Sun, meafured with an HADLEY's *Quadrant.*

	h ′ ″
Weft limb 41° 57′ - - - - - - - -	21.21.58,5
Eaft do. 42° 29′ - - - - - - - - -	25.08,5
15th, Paffed the Meridian - - - - - - -	20.59.29
16th, do. - - - - - - - - - - -	58.08,5
17th, Still vifible.	

Diftances meafured as before.

	h ′ ″
From neareft limb 42° 31′ - - - - - - -	0.08.10
From furtheft do. 43° 05′ - - - - - - -	0.12.14

1780,

1780, 18*th March*, *an Appulſe of* Venus *to* Mars.

Inch. Non.		*Diſtances.* ′ ″	*Apparent Time correct.* h ′ ″
2,45,,3	=	15.17,2	7·39·33,9
2,45,,8	=	15.20,9	44·33,9
2,45,,5	=	15.18,7	49·33,9

N.B. The ſcale of the micrometer is divided into twentieth parts of an inch, and the nonius ſubdivides theſe into twenty-five parts each.

The next morning the *Sun*'s diameters were meaſured.

	Inch.		*Non.*
Horizontal	5,15	,,	17,25
Vertical	5,10	,,	21
Mean	5,15	,,	06,625
Error of micrometer		+	4
	5,15	,,	10,625

Sun's diameter by Ephemeris 32′ 11″,6, from which the diſtances were calculated.

19*th March*, *Difference of Declinations*, *and right Aſcenſion.*

Inch. *Non.*		′ ″		*Apparent Time correct.* h ′ ″
4,20,,00	=	26.08,7	at	7·41·51,4
Mars paſſed the vertical wire				43·09,4
Venus do.				45·16,4

Mars was ſouth of *Venus.*

Obſervations of Mars.

An Appulſe of Mars to κ Libræ.

Diſtances. *Inch.* *Non.*		′ ″	h ′ ″
1,00,,19	=	6.18,5	10.50.05
1,00,,17	=	6.17,0	10.58.05

The ſtar was weſt of *Mars.*

Obſervations

Observations of the Moon.

1775, 12*th January, An Occultation of* Aldeberan.

Immersion, - - - - - - - $8^h.54'.55''$

I believe the watch was set by equal altitudes, but I have lost the book in which the entry was made, and have only a copy of my observations as a register of this and the next that follows.

15*th February, an Eclipse of the* Moon.

End $10^h.15'.00'',5$, apparent time correct.

1776, 3*d March, an Occultation of* Regulus.

Not having an ephemeris at the time, the observation was accidental, and consequently not prepared for. The transit instrument was but lately put up, and had not been much used, but it was the only resource for time; accordingly, it was adjusted truly as to level and wires, but it was not in the meridian accurately. Therefore, the transits of several stars were taken to determine the position of the instrument, and the error of that being known, the times could be corrected by a very easy rule, which I subjoin. Let x be the error in seconds at the horizon, a and b the sines of the zenith distances of two stars, A and B the sines of the polar distances, d the difference of the errors of the clock, as found from the observed and the calculated transit of those two stars. Then $\frac{x\ a}{A}$ will be the space at the equator for the equation to correct one, and $\frac{x\ b}{B}$ the same for the other, and the sum of these two will be equal to $d \times 15$; or, which is the same thing, $\frac{x\ a}{15\ A} + \frac{x\ b}{15\ B} = d$. Whence for all small angles $x = \frac{15 \times d \times A\ B}{a\ B + b\ A}$.

ζ and γ *Leonis* were the two stars that were relied on for time and position, because they pass so nearly at equal distances from the zenith, that the mean of their errors of the clock would be so near to the true one, that any clock yet invented could not shew the difference actually.

The difference of their errors was $5'',6$, and thence the error of the transit instrument was only $1246'',16$ at the horizon, and the distance of the wires of the telescope is $1478''$.

3d March.	*Times of paſſing the middle wire.*	*Equation for the error of the inſtrument.*	*Paſſage by calculation.*	*Error of clock.*
☽ Weſt Limb.	10.58.19,5	— 15,08		
η Leonis.	11.01.45,0	— 7,16	10.54.56,8	6.41,04
α Leonis.	03.11	— 14,07	56.15,9	6.41,03
ζ The Northern.	10.33			
ζ The Southern.	10.39	+ 3,01	11.04.00,6	6.41,41
γ The Southern.	14.04			
γ The Northern.	14.08	— 2,59	07.24	6.41,41
δ Urſæ Majoris.	13.08.48	+ 92,27	13.03.43,9	6.36,37
ε Urſæ Majoris.	48.40	+ 92,01	43.34	6.38,00
Immerſion.	14.02.39,5			
It was emerged, but I did not ſee the Emerſion.	52.30			

6th March, Equal Altitudes, by an HADLEY'*s Quadrant and Quickſilver.*

Quadrant.

° ′			h ′ ″	
30,00	riſing,	-	20.29.41	
	falling,	-	27.42.30	6.05,5
° ′				
30.30	riſing,	-	20.32.14	
	falling,	-	27.39.56	6.05,0
			Mean, -	6.05,25
			Equation of equal altitudes, -	- 7,10
				5.58,15

This compared with the error of the clock by ζ and γ, ſhews that it was loſing 17,″06 daily; at which rate, to the time that ε Urſæ Majoris paſſed the meridian, it muſt have loſt 1,″95, and the error by ε ought to have been 6.′39,″4. The difference is only 1,″4, which is not greater than the errors of obſervation may ſometimes be in ſtars of great declination.

Reſult.	*Apparent time correct.*
	h ′ ″
☽ Weſt limb paſſed the meridian - - -	10.51,23
Regulus, - - - - -	56.15,5
Immerſion, - - - - -	13.56.00,15

And emerged in leſs than 50′.

1776,

1776, 30*th July, An Eclipse of the* Moon.

Beginning of total darkness.

	Apparent time correct. h ′ ″
By eye, - - - - -	17.00.49
By telescope, - - - - - -	01.16

Clouds prevented any other observations.

1777, 20*th January, An Occultation of* ζ Geminorum *by the* Moon.

	Apparent time correct. h ′ ″
Immersion, - - - - -	13.37.38,6

23*d January, An Eclipse of the* Moon.

	Apparent time correct. h ′ ″
Eclipse began, - - - - -	8.41.21,7
Shadow well defined, - - - -	44.33,7
Mare Humorum touched, - - - -	49.13,7
Grimaldus, do. - - - - -	50.43,7
Grimaldus passed, - - - -	53.18,7
Mare Humorum, do. - - - -	53.33,7
Tycho's dark circle touched, - - - -	56.13,7
Tycho's body, do. - - - -	56.40,7
Copernicus, do. - - - - -	9.26.28,7
Do. passed, - - - - -	33.23,7
Going off again.	
Copernicus passed, - - - -	10.12.58,5
Grimaldus, do. - - - - -	21.23,5
Mare Humorum touched, - - - -	36.17,5
Aristæus passed, - - - - -	37.33,5
Mare Humorum, do. - - - -	47.23,5
Regiomontanus, do. - - - -	11.00.08,5
Tycho's body, - - - - -	02.33,5
Tycho's dark circle passed, - - - -	05.38,5

Vendelin,

	h ′ ″
Vendelin, do. - - - - -	12.23,5
Faint Penumbra remained, - - - -	32.25,5
Limb clear. End, - - - -	33.33,5
☽ Weſt limb paſſed the meridian, - - -	12.03.22,7
Eaſt do. do. - - - - -	05.38,2

The times are thoſe of the ſhadow's edge, unleſs it be otherwiſe expreſſed.

1777, 13*th February*, *An Occultation of* μ Ceti.

	Apparent time correct. h ′ ″
Immerſion, - - - - -	7.53.46,7

I was very certain of the time of the immerſion. Five ſeconds before it, the ſtar began to change colour and to loſe light ſenſibly; one ſecond before the immerſion, it was conſiderably broader and redder than at firſt: and the light was not ſo ſtrong as before.

This ſupports the ſuppoſition of an atmoſphere round the moon, though it does not extend to any great diſtance. It has been doubted, and is I believe not yet abſolutely admitted. But our atmoſphere may be doubted by an inhabitant of the moon, for if to its greateſt extent, ſuppoſed 45 miles, it were of the ſame denſity as at the ſurface of the earth, which is not the caſe, it would not ſubtend a minute, as the earth is 8000 miles in diameter, and the greateſt parallax only 62′.

1777, 16*th May*, *An Appulſe of the* Moon *to* ν Scorpii.

	Apparent time correct. h ′ ″
☽ Weſt limb paſſed the meridian, - - -	7.59.50,1
ν Scorpii do. - - - - -	8.00.02,1

By the arch of the tranſit inſtrument, the ſtar was 10′ from the limb.

1779, 1*ſt May*, *An Appulſe of the* Moon *to* Mars *and* Saturn.

Having brought the *Moon*'s limb to run along a wire of declination,

	Apparent time correct. h ′ ″
The eaſtern limb paſſed the vertical wire, - -	10.23.09,5
Saturn paſſed the ſame, - - - -	10.23.21,5

Saturn did not come within the ſcale of the micrometer.

For

For the right Aſcenſions.

		Apparent time correct. h ′ ″
Mars	Paſſed the meridian at - -	12.55.42
Saturn		56.34
☽ Eaſtern limb		57.36

Diſtances of the Moon *and* Mars.

Inch.	Non.		′ ″		Apparent time correct.
4,70 „	08,5	=	28.40,3	————	13.18 42,5
4,65 „	21,	=	28.31,1	————	26 34,5
4,65 „	15	=	28.26,7	Mean of the three times and the ſame meaſure,	31.53,5
4,65 „	21	=	28.31,1	————	36.49,5
4,70 „	05	=	28.37,7	————	41.06,5

1779, 3d *May*, *An Appulſe of the* Moon *to* B Ophiuchi.
Difference of Declination.

Inch.	Non.		′ ″		Apparent time correct.
4,70 „	17	=	28.09,9	————	10.22.58,1

The ſtar was to the weſt of the *Moon*'s horn from which the diſtance was meaſured, becauſe the micrometer could not take in the limb.

Inch.	Non.		′ ″		Apparent time correct.
4,60 „	17	=	28.09,9	————	10.22:51,1

Examination of the Micrometer.

		Inch.	Non.
1ſt May, 19ʰ. 29′.	leſſer diameter of the *Sun*, - -	5,2 „	13
	Again, - - - -	5,2 „	15
	Greater diameter, - - -	5,2 „	23
	Again, - - - -	5,2 „	24
	Hence mean diameter -	5,2 „	17,5

There are twenty-five nonius to divide one twentieth of an inch.

When the limbs coincided, the Zero's agreed.

The ephemeris gives 15′.54″,6 for the ſemi-diameter, therefore one nonius is equal to 0″,7294.

1779,

1779, 23*d November, An Eclipſe of the* Moon.

	Apparent time correct.
	h ′ ″
Beginning, - - - - -	12.02.33,0
Shadow well defined, - - - -	03.36,0
Ariſtarchus, - - - - -	10.37,9
Inſula Ventorum - - - - -	12.14.32,9
Copernicus, - - - - -	21.18,9
Mare Vaporum, - - - - -	32.07,8
Bright ſpot in Mare Vaporum, - - -	34.27,7
Tycho's body touched, - - - -	35.29,7
Mare Serenitatis, do. the border, - - -	35.47,7
Tycho paſſed, - - - - -	36.52,7
Mare Tranquilitatis touched, - - - -	40.17,6
Ariadæus, - - - - -	41.37,6
Mare Serenitatis paſſed, - - - -	44.07,6
Meerob, - - - - -	51.37.5
Mare Criſium touched, - - - -	52.37.5
Do. paſſed, - - - - -	56 40,4
Total Darkneſs by eye, - - - -	13.00.37,5
By teleſcope, - - - - -	01.41,3
Do. end by teleſcope, - - - -	14.40.13,3
By eye, - - - - -	41.16,3
Grimaldus paſſed, - - - - -	43.06,3
Ariſtarchus, - - - - -	50.42,2
Inſula Ventorum touched, - - - -	53.46,2
Paſſed, - - - - - -	54.20,2
Copernicus, - - - - -	15.02.44,1
Tycho's body touched, - - - -	04.56,0
Paſſed, - - - - - -	06.23,0
Mare Criſium touched, - - - -	32.22,7
Paſſed, - - - - - -	35.55,7
Mare Fæcunditatis paſſed, - - - -	37.23,6
End by teleſcope, doubtful, - - - -	39.45,6
Certain - - - - -	42.00,6

The

The apparent times here noted in theſe obſervations were derived from the mean times. The difference between the clock and mean time being applied to the hours ſhewn by the clock. And as the difference or equation was derived from the tranſit inſtrument, here follows an examination of its poſition.

	Tranſits over the middle wire by clock.	Difference between the clock and mean time.
22d November.	h ′ ″	
⊙ Weſt Limb.	23.42.34	
Eaſt do.	44.53	
Center.	23.43.43.5	
Eqtn. time.	0.13.19,5	
		′ ″ — 2.57 to be added to all the tranſit hours.
23d November.		
α Arietis.	9.42.02	
☽ Weſt Limb.	11.38.28	
☽ Eaſt do.	40.51	
Rigel.	12.50.41	
Bellatrix.	13.00.01	
Caſtor.	15.06.51	
Procyon.	14.05	
1ſt December.		
⊙ Weſt limb.	23.45.26	
Eaſt do.	47.47	
Center.	23.46.36,5	′ ″
Eqtn. of time.	10.17,7	—3.05,8

Equal Altitudes with the Quadrant which has only one Wire.

	N.B Before and after this laſt tranſit.	Another altitude not moved.
	h ′ ″	h ′ ″
Riſing U limb.	20.16.41	20.23.47
L limb.	20.19.38,5	20.26.46,5
Falling L limb.	27.13.27	27.06.17
U limb.	27.16.23	27.09.19
Center.	23.46.32,4	23.46.32,4
Equation of equal altitudes,		+ 4,37
		23.46.36,77

			Apparent time correct.
			h ′ ″
1780, 18th February, ☽ Eaſt limb paſſed the meridian	-	-	10.39.31,6
15th April, ☽ Weſt limb paſſed the meridian	-	-	9.17.34

5th

5th August, an Appulse of the Moon *to* Jupiter.

	h ′ ″
☽ West limb passed a circle of the meridian, - - -	7.14.44
Jupiter's western limb, - - - - -	14.48
Eastern do. - - - - - - -	14.58
Center, - - - - - - -	18.49
☽ West limb, - - - - - - -	00.53
Jupiter's center, - - - - - -	25.06
☽ - - - - - - - -	25.19
Jupiter's center, - - - - - -	42.31
☽ - - - - - - - -	43.08
Jupiter, - - - - - - -	51.21
☽ - - - - - - -	52.15
Jupiter, - - - - - - -	8.42.22
☽ - - - - - - - -	44.42

The difference of declination of *Jupiter*, and the nearest horn of the *Moon*, was - 9′.01″,4 at - - - - 7.28.40

Distances of Limbs.

′ ″	
14.33,2 - - - - - - - -	7.32.12
15.01,5 - - - - - - - -	35.36
15.32,7 - - - - - - - -	38.53
16.25,9 - - - - - - - -	44.31
17.06,5 - - - - - - - -	48.16
30.58,6 - - - - - - - -	8.35.49

OBSERVATIONS

OBSERVATIONS *at large for determining the Latitude of the* TREASURY GATE *in* FORT WILLIAM *in* BENGAL.

	Face East.	*Face West.*	*Mean or observed altitude.*	EQUATIONS. *Refraction.*	EQUATIONS. *Aberration.*	EQUATIONS. *Nutation.*	*Altitude correct.*	*Declination.*	*Latitude.*	
	° ′ ″	° ′ ″	° ′ ″	″	″	″	° ′ ″	° ′ ″	° ′ ″	
γ Tauri.	80.57.37,3	89.58.16	89.57.56,6	0	+ 2,34	— 0,43	89.57.54,7	22.30.56,4	22.33.01,7	N. B. Face east, 15th Jan. 1779, when the barometer was 30,50, and the thermometer 63.5.
τ Tauri.	88.41.47	88.42.28	88.42.07,5	— 1,2	+ 0,82	— 0,63	88.42.06,5	21.15.26,2	19,7	
o Tauri.	89.09.49,7	89.11.04	89.10.26,9	0,7	+ 0,95	— 0,39	89.10.25,1	21.43.46,5	21,4	
ζ Tauri	88.25.48,8	88.26.45,0	88.26.16,9	1,4	+ 0,7	+ 0,7	88.26.16,9	20.59.23	06,1	
132 Tauri.	88.05.07,9	88.04.17	88.04.42,5	2,9	+ 1,11	+ 1,05	88.04.41,8	24.28.25,9	07,7	
π Geminorum.	89.18.11,7	89.17.08	89.17.39,8	0,6	+ 0,16	+ 1,49	89.17.39,8	23.15.25,3	05,1	
μ Geminorum.	89.57.17,3	89.55.58,0	89.56.37,6	0	+ 0,44	+ 2,03	89.56.40,4	22.36.32,7	13,1	Face west 19th Jan. when the barometer was 30,50, and the thermometer 65, agreeably to which the refraction is taken.
ν Geminorum.	87.46.28,2	87.47.17	87.46.52,6	2,2	+ 0,84	+ 2,6	87.46.53,8	20.20.00,3	06,2	
								Mean -	22.33.09,4	
Aldeberam.	83.29.09,7			6,7	+ 0,82	— 0,63	89.29.03,2	16.02.58 N.	22.33 54,8	
Rigel.	58.57.52,2			33,7	— 5,1	+ 0,12	58.57.13,8	8.28.15,9 S.	34.30,3	
α Orion.	74.47.00			15,3	— 2,2	+ 1,28	74.46.43,8	7.20.57 N.	34.13,8	
γ Geminorum.	84.00.29,9			6,0	+ 2,5	+ 2,00	84.00.28,4	16.34.11 N.	33.47,6	
Syrius.	51.00.43,5			45,5	+ 4,6	— 2,75	51.00.00	16.25.04,3 S.	34.15,7	
								Mean -	22.34.07,4	
Capella.		66.47.18		23,5	+ 6,8	— 0,06	66.47.00,3	45.45.12,5	22.32.12,8	
β Tauri.		84.08.43		5,6	+ 2,4	+ 0,37	84.08.40,2	28.24.08	48,2	
136 Tauri.		84.59.37,1		4,8	+ 1,2	+ 1,2	84.59.34,7	27.32.27,1	01,8	
θ Aurigæ.		75.21.42,8		15,0	+ 2,4	+ 1,2	75.21.31,4	37.10.34	05,4	
ε Geminorum.		87.12.30		2,9	— 0,4	+ 2,6	87.12.29,3	25.19.52,4	11,7	
								Mean -	22.32.16	

Mean of the last two sets, 22.33.11,7

Double collimation or difference of the last two sets, 1.51,4

Latitude by the whole, 22.33.10,55

TRIVA-

TRIVATOORE.

Obſervations by T. D. P. 1783.

Day.		h ′ ″		′ ″
⊙ On the meridian, December 5,	- -	23.33.52,5,	ſlow,	26.07,5
⊙ On the meridian, December 6,	- -	23.35.53,1,	ſlow,	24.06,9
Daily gain	- -			2.00,6

The equation of equal altitudes was applied.

An emerſion of Jupiter's *firſt Satellite.*

		h ′ ″
6th December, by watch emerged,	- -	6.31.53
Too ſlow at noon,	- -	+26.07,3
Gain till obſervation,	- -	— 34,4
Emerſion,	-	6.57.25,9
Ephemeris,	-	1.36.52,0
Longitude in time,	-	5.20.33,9
In degrees	-	80°.08′.28″,5

		h ′ ″		
⊙ On the meridian, December 28,	-	23.26.37		
Equation of E. A.	- - - -	— 1,9		
		23.26.35,1,	ſlow,	33.24,9
⊙ On the meridian, December 30,	- -	23.23.40,3		
Equation of E. A.	- - - -	- 1,9		
		23.23.38,4,	ſlow,	36.21,6

Daily loſs, - 88″,4

An emerſion of Jupiter's *firſt Satellite.*

		h ′ ″
29th December, by watch emerged,	- -	6.27.07
Too ſlow at noon	-	33.24,9
Loſs till obſervation at 88,4		25,8
Emerſion	-	7.00.57,7
Ephemeris,	-	1.40.44,0
Longitude in time,		5.20.13,7

In

In degrees,	-	80°.03′.24″,6
The mean of the two Longitudes,	-	80.05.56,5

The diſtance between the flag in the fort, and the place of obſervation at *Trivatoore*, was determined by a long baſe meaſured in the ſands, and by taking angles for trigonometrical calculations.

Madras flag, diſtance,	- - -	2787,1 feet.
Bearing,	- - -	S. 10.33.50 W.

Which give difference of Longitude, 50″,5.
Latitude, 4′.30″,7.

VIPEREE.

Having borrowed the quadrant that Mr. HURST uſed in the tranſit of *Venus*, I was deſired not to alter its line of collimation till I had determined the quantity of error: thoſe obſervations are in the tables of latitude. It was uſed in the ſurvey to *Calcutta*.

As I intended to obſerve at this place, I determined its diſtance from the fort, as accurately as I could by trigonometry. The reſult is:

Madras flag, diſtance,	- - -	8072,2 feet.
Bearing,	- - -	S. 23,15,00 E.

Which give difference of Latitude 31″,5

MADRAS.

Latitude of *Trivatoore*, ſee table,	- - - -	13°.09′.00″,4
Madras ſouth of it,	- - - -	— 4.30,7
Latitude	-	13. 4.29,7
Latitude of *Viperee*, ſee table,	- - - -	13.05.05.4
Madras ſouth of it,	- - - -	— 31,5
Latitude,	-	13.04.33,9
Mean - 13.04.31,8.		
Longitude of *Trivatoore*, Mean,	- - - -	80.05.56,5
Madras weſt of it,	- - - -	— 00.50,5
Longitude,	-	80.05.06,0

WUNGOLE,

WUNGOLE, 1782, *commonly called* ONGOLE.

Obſervations by T. D. P.

14th November, double altitudes of the pole, with the ſmall ſextant made by RAMSDEN, and the artificial horizon.

Watch.	*Angles.*	
9.16.12	34.45.30	these were with the ſmall ſextant.
21.00	47.30	
31.00	45.30	
49.00	46.30,	this was with the large ſextant.
9.29.18	34.46.15	
	17.23.08	
	+ 2.40	* beneath meridian.
	− 2.58	refraction.
	17.22.50	meridian altitude.
	1.51.13	polar diſtance.
	15.31.37	Latitude.

16th November, with the octant double altitudes of the *Sun*.

	Upper L.	*Lower L.*
	° ′ ″	° ′ ″
12.00.28	111.51.00	
2.24	54.00	
4.14		110.48.20 M. A.
5.41	111.56.00 M. A.	
6.36		110.47.00

Obſerved

			° ′ ″
Obſerved altitude,		-	55.41.05
Ref. and par.		-	— 34
Meridian altitude correct,	-	-	55.40.31
Declination,	-	-	S. 18.49.05
Co. Latitude,	-	-	74.29.36
Latitude,	-	-	15.30.24

1784, The Latitude obſerved by T. D. P. (ſee obſervations at large) was,

15° 29′ 16″

This is inſerted only to bring to teſt the accuracy of the octant, which is mentioned (page 8) in the introduction: and it appears, that by a ſingle obſervation made with it, the Latitude was determined within 1′.8″.

It ſerves alſo to ſhew that, though it is very difficult to take double altitudes of ſo faint a ſtar, in low latitudes, even the polar ſtar may be uſed to great advantage: and in theſe hot climates, the ſtars only can be employed, for the *Sun*'s heat at noon, after a long march, is really not to be borne by any conſtitution.

MASULIPATAM, 1782. *By* T. D. P.

27th October, ⊙ diameter forward 33, Backward 32, } then ſet the ſpeculum to 90°, and ſhifted the index back.

Double altitudes of the *Sun*'s lower limbs taken with the HADLEY's octant and the artificial horizon.

Watch.	*Angles.*	
h ′ ″	° ′ ″	
12.19.21	120.52.20	
20.32	120.55.20	
28.17	121.21.00	
30.40	121.23.30	
31.38	121.24.00	
32.34	121.25.40	Meridian.
34.23	121.23.20	

Obſerved

Obſerved meridian altitude, - - -	L. L.	60°.42′.50″
Error of quadrant, - - -	-	— 30
Semi-diameter, - - -	-	+ 16.10
Ref. and par. - - -	-	— 27
Altitude, -		60.58.03
Declination, -	S.	12.51.09
Co. Latitude, -		73.49.12
Latitude, -		16.10.48

28th October, quadrant the ſame as above.

The mode the ſame, double altitude, - -		120°.45′.00″
Meridian altitude correct, - - -		60.37.42
Declination, - - -	S.	13.11.55
Co. Latitude, - - -		73.49.37
Latitude, -		16.10.23

1ſt November, ⊙ diameter, 34 forwards, 33 backwards, } then ſet the ſpeculum to 90°.

Time. h ′ ″	*Upper L.*	*Lower L.*
12.14.56		
	119.13.10	
15.33		118.04.30 M. A.
16.11	119.14.50 M. A.	

Obſerved meridian altitude, - - - -		59°.19′.50″
Ref. and par. - - - -		— 30
Error of quadrant, - - - -		— 30
Meridian altitude, -		59.18.50
Declination, - -	S.	14.30.45
Co. Latitude, -		73.49.35
Latitude, -		16.10.52

The

The ſame day Lieutenant HUMPHRYS obſerved a ſextant made by RAMSDEN, about four inches radius; he made the angles of the lower limb 118°.09.00″, and the error of his quadrant was —2′, which gave the latitude 16°.11′.05″. This was intended as a kind of teſt of the inſtruments, but it was not a fair one, and yet the reſult is cloſer than could be expected, conſidering the difficulty of reading the ſmall one.

Mean of three latitudes with octant - 16°.10′.32″

⊙ On Meridian, October 29th,	00h.04′.56″	too faſt - -	4′.56″
By the ſmall watch, ——— 30th,	00.08.36,5	- - -	8.36,5
——— 31ſt,	00.12.37	- - - -	12.37
November 1ſt,	00.16.36,5	- - -	16.36,5

Examination of the large watch uſed at the obſervation of *Jupiter*'s Satellite.

29th October, altered the ſpring and ſet it a-going at one o'clock.

	Small watch.	*Large watch.*		
October 29th, - -	22h.37′.00″			
Too faſt, - - -	8.23,2			
Solar time, - - -	22.28.36,8	22h.34′.42″	too faſt, -	6′.05″,2
November 1ſt, - -	1h.46′.00″			
Too faſt, - - -	0.16.54			
Solar time, - - -	1.29.06	1.35.57,5	too faſt, -	6′.51″,5

Therefore in 51 hours ſolar time, the large watch gained 46″,3.

An emerſion of Jupiter'*s firſt Satellite.*

1ſt November, by watch emerged, - - -	7h.27′.20″
At laſt obſervation, too faſt, - - -	— 06.51,5
Gained afterwards at 46″,3 - - -	— 05,3
Emerſion, -	7.20.23,2
Ephemeris, -	1.56.15
Longitude in time, -	5.24.08,2
In degrees, -	81°.02′.03″

The

The obſervations before written were made at the Chief's garden. The Fort flag was diſtant 2′,5″ in a ſtrait line, and bore S. by E. which give difference of

Longitude,	- - - -	+ 30″
Latitude,	- - -	— 2′.28″
Longitude of Gardens,	-	81.2.03
		+ 30
Longitude of Flag,	- -	81.2.33
Latitude of Gardens,	- -	16.10.32
		— 2.28
Latitude of the Flag,	- -	16.08.04

PEDDAPOORE, 1784.

Obſervations by T. D. P.

			h ′ ″
α Serpentis, on the meridian, June 18th		- -	9.36.45
Do. - -	19	- - -	9.28.57,5
			7.47,5
	Accelleration for the time,	-	4.09,4
	Loſs in one day,	-	3.38,1
⊙ On the meridian, June 18, -	h ′ ″ 23.51.47,75,	ſlow, -	′ ″ 8.12,25

An immerſion of Jupiter's *Firſt Satellite.*

The planet was extremely bright, and the Belts diſtinct and clear; the glaſs perfectly ſteady.

		h ′ ″
19th June, by watch changed colour,	- -	15.16.22
Immerged,	- -	15.18.38
Too ſlow at noon,	- -	+ 8.12,25
Loſs to obſervation at 219,	- -	+ 2.21
Immerſion,	- -	15.29.11.25
Ephemeris,	- -	10.00.13
Longitude in time,	- -	5.28.58,25
In degrees,	- -	° ′ ″ 82.14.34

From

From the obſervations at *Calcutta*, it appears that there is a difference between the Longitudes derived from obſervations of immerſions and emerſions.

	h ′ ″
The mean of Longitudes, 10 in number, derived from obſervations of immerſions, with an 18-inch reflector, was, -	5.53.53,77
Of emerſions (2) with the ſame inſtrument, - -	5.53.43, 4
The ſingle immerſion with *Dollond*'s triple object glaſs, is, -	5.53.57, 8
The mean of 4 emerſions with the ſame, - - -	5.53. 3, 9
Difference by the reflector, - - - -	0. 0.10,77
By *Dollond*'s refractor, - - - - -	00.00.54,90
The mean of all the immerſions, (11) - - -	5.53.54,13
Emerſions, (6) -	5.53.17, 4
Difference, -	36,73

As the glaſs with which the obſervation was made, differed from both, the difference derived from the whole is to be preferred, and ſo 9′.25″ are to be ſubtracted from this, to compare it with the other places, which were all emerſions, and then the Longitudes of *Peddapore*, by emerſions, will be 82°.05′.19″.

KOSSIM KOTTA, 1782.

Obſervations by T. D. P.

9th October, Double altitudes of *Jupiter* from the artificial horizon.

h ′ ″		° ′ ″
7.47.00	—	55.10.00
48.36	—	54.28.50
49.57	—	54.01.20
50.58	—	53.37.10
52.02	—	53.13.10
53.05	—	52.50.00
7.50.16	Mean,	26.56.43 Apparent altitude.
		— 1.51 Ref.
		26.54.52

	h ′ ″
Jupiter's R. A. at the time, -	17.32.06,7
Declination, do. - -	S. 23°.12.10
☉ R. A. at do. - -	13.00.24,8
Latitude, - - -	17.42.30
Derived from the obſerved Latitudes of *Elmulchillie* and *Sobaurum*.	

From

		h ′ ″
From the above data the planet had paſſed the meridian,	-	3.16.37,3
Jupiter's R. A.	- - -	17.32.06,7
		20.48.44
☉ R. A.	- - -	13.00.25
Time,	-	7.48.19
Watch,	-	7.50.16
Too faſt,	-	1.57

The watch gained 12″ daily by the meridian of *Vizacpatam.*

An Emerſion of Jupiter's *firſt Satellite.*

		h ′ ″
9th October, By clock emerged,	- - -	7.11.45
Too faſt at the obſervation,	- -	— 1.57
Emerſion,	- -	7.09.48
Ephemeris,	- -	1,38.00
Longitude in time,	- -	5.31.48
In degrees,	- -	° ′ ″ 82.57.00

VIZACPATAM, 1782.

Obſervations by T. D. P.

An Emerſion of Jupiter's *ſecond Satellite.*

		h ′ ″
3d October, emerged,	- - - -	8.30.58
Ephemeris,	- -	2.57.20
Longitude,	- -	5.33.38
° ′ ″ 83.24.30		

An

An Immerſion of Jupiter*'s third Satellite.*

	h ′ ″
7th October, immerſion, - - - -	8. 9.57

The time was ſhewn by Mr. RUSSELL's time-keeper, which was made by ARNOLD, and was regulated by the meridian line in his hall.

7th September, An Emerſion of Jupiter*'s firſt Satellite.*
By T. D. P. 1784.

	h ′ ″
7th September, by watch emerged, - - -	8.23.38
Sky remarkably clear and glaſs ſteady. Full ſplendor, - -	25.40

Obſervations for time.

	h ′ ″		Zenith diſtance. ° ′ ″
7th September, ⊙ U. L.	22.22.25	By arch of 90, -	41.29.20
			D. S. D. Non.
	24.48	96, -	44.01.01
Latitude by 2 northern ſtars,		See obſervations at large	17.44.33,4
2 ſouthern ſtars,		under *Vizacpatam.*	17.38.46,5
N. B. Refraction, + 50″		True Latitude, - -	17.41.45
		Error of Collimation, - -	+ 02.58
⊙ Declination for the time and place, - - - -			N. 5.30.39
			h ′ ″
From the above data, the time was, - - - -			21.17.15,5
		By the watch, - -	20.23.36,5
		The watch too ſlow, - -	53.39

Day.		Middle wire. h ′ ″	Upper wire. h ′ ″		h ′ ″
8th September, α *Aquilla* riſing,	-	7.01.13	7.03.16		
Falling,	-	8.07.35	8.05.30		
On the meridian,	-	7.34.24	7.34.23	=	7.34.23,5
Paſſage by calculation,	-	-	-	-	8.29.55,5
Watch too ſlow,		-	-	-	55.32

8th

8th September, ☉ *zenith distance.*

	h ′ ″		D. S. D. Non.	Zenith distance. ° ′ ″
☉ L.	19.13.55	90		56.59.20
☉ U.	16.06	96	60.03.05	56.59.23
U.	16.49	90		56.18.20
L.	19.00	96	60.00.07	56.18.04,6
U.	21.57	90		55.05.00
L.	24.09	96	58.03.00	55.04.41,2
U.	25.18	90		54.18.00
L.	27.28	96	57.03.20	54.17.12,7
	19.20.20		Mean, -	55.40.00,3

☉ Declination, - N. 5.09.42 (° ′ ″)
Latitude, - 17.41.45

		h ′ ″
From the above data, time,	-	20.17.30
Watch,	-	19.20.20
Watch slow,	-	57.10

Therefore the watch lost in 22.57 (h ′) - 211,0 (″)
And consequently daily, - - 221,0

Day.	h ′ ″		h ′ ″
8 at	7.34.23,5	watch too slow, 55.27.9	
7 at	8.23.38	the emersion happened -	0.55.32,0
Difference,	23.10.45,5	loss in this time, at 221, -	— 3.33
		Therefore slow at emersion, -	51.59
		Emersion by watch, -	8.23.38
		Time of emersion, -	9.15.37
		Ephemeris, -	3.42,56
		Longitude in time, -	5.32.41
		In degrees, -	83.10.15 (° ′ ″)

October

October 23d, An Observation of Jupiter's *first Satellite, by Mr.* MAXTON.

The glass the same as mine: and the watch corrected by Mr. RUSSELL's meridian line.

		h ′ ″
Emersion by watch,	-	10.5.30
Watch fast,	-	6.05
Emersion,	-	9.59.25
Ephemeris,	-	4.26.08
Longitude in time,	-	5.33.17
In degrees,	-	83°.19′.15″.

This was the instant of first appearance, as well as Lieut. COLEBROOKE's, who observed the same at *Vizianagarum* palace.

		° ′ ″
Longitude by T. D. P.	-	83.10.15
by M.	-	83.19.15
Mean,	-	83.14.45

Mr. RUSSELL also made an observation, which I do not use, because he noted the time of full splendor, which is uncertain; it follows:

			h ′ ″
16th October, Watch fast at noon,	-		1.43,5
Gained daily,	-	56″,5	
Add its gain to the observation,	-		18,5
Watch fast,	-		— 2.02
Time of full splendor,	-		8. 4.39
Time of observation,	-		8. 2.37
Ephemeris,	-		2.29.17
Longitude in time,	-		5.33.20
			° ′ ″
In degrees,	-		83.20.00

BEEMUL-

BEEMULWILSA, 1784.

Obſervations by Lieutenant COLEBROOKE.

		h ′ ″			
☉ On meridian, Auguſt 7th,	-	23.40.23,15			
Equation of E. A.	-	+ ,60			
		23.40.23,75	ſlow,	-	′ ″ 19.36,25
☉ On meridian, Auguſt 12th,	-	23.22.30, 5			
Equation of E. A.	-	+ 0,75			
		23.22.31,25	ſlow,	-	′ ″ 37.28,75
		Loſs in 5 days,		-	17.52.50
		Daily loſs,		-	3.34, 5

An Immerſion of Jupiter's *ſecond Satellite.*

This was with his firſt obſervation.

			h ″ ′
8th Auguſt, by watch immerged,	-	-	12.33.20
Too ſlow at noon,		-	19.36,25
Loſs to the obſervation, at 214″,5		-	1.55, 2
Immerſion,		-	12.54.51,45
Ephemeris,		-	7.20.50
Longitude in time,		-	5.34,01.45
			° ′ ″
In degrees,		-	83.30.15,00

Auguſt 13*th, by* T. D. P.

			h ′ ″
Jupiter's firſt Satellite vaniſhed by the watch,	-	-	11.32.28

6 or 8 ſeconds before the time noted, it had not changed colour: a cloud came on and hid it for about 8 ſeconds, and when it was gone, the Satellite had vaniſhed.

Auguſt 20*th, by* T. D. P.

			h ′ ″
Jupiter's firſt Satellite vaniſhed by the watch,	-	-	14.2.30

The

The ſky was clear, the glaſs ſteady: here I expected what happened, and was on my guard. The Satellite vaniſhed at a ſmall diſtance from the body, *i. e.* before the contact, and without changing colour.

	Day.	h ′ ″		
☉ On meridian, Auguſt	19th, -	23.57.13,25		
Equation of E. A.	- -	+ 1, 5		
	19th, - -	23.57.14,75	ſlow, -	2′.45″,25

Immediately before this obſervation, the watch was ſet forward one hour without ſtopping it. By comparing this with the obſervation of the 12th, the watch loſt daily, 3′.36″,6.

The foregoing obſervation of time, is only of uſe for the erroneous immerſions of the 13th and 20th.

	Day.	h ′ ″		
☉ On meridian, Auguſt	27th, -	23.41.26,5		
Equation of E. A.	- -	+ 2,1		
	27th, - -	23.41.28,6	ſlow, -	18′.31″,4

	Day.	h ′ ″		
☉ On meridian, Auguſt	29th, -	23.35.17,5		
Equation of E. A.	- -	+ 2,4		
		23.35.19,9	ſlow, -	24′.40″,1

Daily loſs, - 3′.04″,4

An Emerſion of Jupiter*'s firſt Satellite, by Lieutenant* COLEBROOKE.

		h ′ ″
29th Auguſt, by watch emerged,	- - - - -	12.27.00
Too ſlow at noon, after the obſervation,	- - -	+ 24.40,1
Loſs after the obſervation,	- - - -	− 1.25,5
Emerſion,	-	12.50.14,6
Ephemeris,	-	7.16.33
Longitude in time,	-	5.33.41,6
In degrees,	-	83°.25′.16″

Obſervations

Obſervations by T. D. P.

☉ On the meridian, September 2,	-	h ′ ″ 23.20.47		
Equation of E. A.	-	+ 02,5		
		23.20.49,5	ſlow, -	39′.10″,5

☉ Altitude, 5th September,	-	h ′ ″ 21.53.55,5	° ′ ″ 67.31.35
Refraction and parallax,	-		− 20
Collimation,	-		+ 51
			67.32.06
☉ Declination at the time and place, -	-		6.14.26
Latitude,	-		17.53.32

From which data, the time was, - h ′ ″ 22.41.10,0

By the watch, - 21.53.55,5 ſlow, - 47′.20″,5

Whence the daily loſs was, - 167″,7

An Emerſion of Jupiter's *firſt Satellite.*

The ſky clear of clouds, and the glaſs ſteady, but the vapours had a perceptible motion through the teleſcope: the Belts were very diſtinct.

5th September, by watch emerged, - - - - h ′ ″ 14.00.35

N. B. Full ſplendor, h ′ ″ 14.2.15. Too ſlow at the altitude of the ☉, taken after the obſervation, + 47.20,5

Loſs after the obſervation, at 167″,7 - − 54,4

Emerſion,	-	14.47.01,1
Ephemeris,	-	9.13.36
Longitude in time,	-	5.33.25,1
In degrees,	-	° ′ ″ 83.21.18

Obſervations

Obſervations by Lieutenant COLEBROOKE.

	h ′ ″		
⊙ On the meridian, September 29th, -	23.38.27,6		
Equation of E. A. -	+ 5,4		
	23.38.33,0	ſlow, -	21′.27″,0
Equation of time, -	23.49.46,4		
		ſlow, -	11.13,4
	h ′ ″		
⊙ On the meridian, October 1ſt, -	23.32.17,3		
Equation of E. A. -	+ 5,7		
	23.32.23,0	ſlow, -	27.37,0
Equation of time, -	23.49.08,6		
		ſlow, -	16.45,6

Daily loſs on ſolar time, - 3′.05″,1

An Emerſion of Jupiter's *firſt Satellite.*

	h ′ ″
30th September, by watch emerged, - - -	9.15.10
Too ſlow at noon, -	+21.27
Loſs till obſervation, at 185″,1, -	+ 1.15
Emerſion, -	9.37.52
Ephemeris, -	4.05.02
Longitude in time, -	5.32.50
In degrees, -	83°.12′.30″

I ſuſpect that a miſtake was committed in writing down the time, and that it ought to have been $9^h.16'.10''$. But this is as it is entered in the original book.

13th October, at 1′.48″ ſet the watch forward one hour without ſtopping it.

	h ′ ″		
⊙ On the meridian, October 15th, -	23.51.53,5		
Equation of E. A. -	+ 6,8		
	23.52.00,3	ſlow, -	7′.59″,7
Equation of time, -	23.45.31,7	faſt, -	6.28,6

 The

The obſervation of the ⊙ paſſage over the meridian was not taken on the next day after the emerſion as uſual, and between the 17th and 18th the watch ran down. Therefore the rate is aſcertained from the mean time, compared with the 29th September, and 1ſt October.

And the watch loſt by the 1ſt,	-	″ 173,6 daily.
By the 2d,	-	174,7
Mean,	-	174,2
Daily variation,	-	+ 11,5
Daily loſs on ſolar time,	-	185,7

An Emerſion of Jupiter'*s firſt Satellite.*

		h ′ ″
16th October, by watch emerged, - - - -	-	7.53.35
Too ſlow at noon,	-	+ 7.59,7
Loſs till obſervation, at 185″,7,	-	+ 1.01,9
Emerſion,	-	8.02.36,6
Ephemeris,	-	2.29.17,0
Longitude in time,	-	5.33.19,6
In degrees,	-	° ′ ″ 83.19.54

Reſult of the Obſervation of Longitude.

29th Auguſt,	Colebrooke, -	° ′ ″ 83.25.16	° ′ 83.25.16
5th September,	Pearse, -	83.21.18	83.21.18
30th do.	Colebrooke, -	82.12.30	rejected.
16th October,	Colebrooke, -	83.19.54	83.19.54
	Mean, -	83.19.44,5	83.22.09,3

VIZIAN-

VIZIANAGARUM PALACE.

An Observation of Jupiter's *second Satellite, by* T. D. P.

22d October, by watch emerged	- - - -	$7^h.16'.06''$
Full splendor,	-	18.18

Observations by Lieutenant COLEBROOKE.

		Equal altitudes.		
* *Fumulboot*, rising,	-	$7^h.48'.10''$		
Falling,	-	9.44.25		
* On the meridian,	-	8.46.17,5		
By calculation,	-	8.54,35,5	slow, -	$8'.18''$
⊙ On the meridian, 22d,	-	$23^h.50'.14'',5$		
Equation of E. A.	-	+ 7,0		
		23.50.21,5	slow, -	$9'.38'',5$

23d October, * *Fumulboot*, rising,	-	$7^h.51'.39''$		
Falling,	-	9.29.05		
* On the meridian,	-	8.40.22		
By calculation,	-	8.50.46,2	slow, -	$10'.24''2$
⊙ On the meridian, 23d,	- -	$23^h.48'.10'',3$		
Equation of E. A.	-	+ 7,6		
		23.48.17,3	slow, -	$11'.42'',7$
From the above, daily loss,	- -	$125'',2$		

An Emersion of Jupiter's *first Satellite.*

By watch emerged,	- - - - -	$9^h.48'.55''$

22d October,

		h ′ ″
22d October, *Jupiter*'s ſecond Satellite emerged, -	-	7.16.06
By *Fumulhoot*, watch ſlow,	-	+ 8.18
Loſs in 1^h.30′ after emerſion, at 125″,2	-	- 07,8
Emerſion,	-	7.24.16,2
Ephemeris,	-	1.49.57
Longitude in time,	-	5.34.19,2
		o ′ ″
In degrees,	-	83.34.48
		h ′ ″
23d October, *Jupiter*'s firſt Satellite emerged, -	-	9.48.55
By *Fumulhoot* too ſlow,	-	+ 10.24,6
Loſs in 1^h.8′ after *Fumulhoot* paſſed at 125″,2	- -	+ 06,0
Emerſion,	-	9.59.25,6
Ephemeris,	-	4.26.08,0
Longitude in time,	-	5.33.17,6
		o ′ ″
In degrees,	-	83.19.54,0

Mr. MAXTON obſerved this at Vizacpatam, and the two obſervations ſhew only 39″ difference of Longitude, but the high hill that lies to the north of the palace bore from *Beemulwilſa*, N. 8°.25′ E. and by trigonometry its diſtance was 22,978 miles, therefore it lay north of *Beemulwilſa*, 19′.28″ and eaſt 2′.52″. The palace lies 12′.20″,3 to the north by obſervations at large, and therefore to the eaſt 1′.48″. But *Beemulwilſa* lies to the eaſt of *Vizacpatam*. Mr. MAXTON's eye, it may be preſumed, is not ſo quick as Lieutenant COLEBROOKE's, and will ſuffice to account for the difference ; for by a particular ſurvey round theſe parts, *Vizianagur* fort does lie 6′.36″ eaſt of *Vizacpatam*.

NARRAINPOOR.

Which by the table of the route lies weſt of *Vizianagarum* palace 2′.

Obſervations

Observations by Lieutenant COLEBROOKE, *for time.*

On the meridian, October 31st,	h ′ ″ 23.36.04,3		
Equation - -	+. 6,4		
	23.36.10,7	slow, -	23′.49″,3
November 1st, -	23.34.39,5		
Equation, -	+ 6,8		
	23.34.46,3	slow, - -	25.13,7
		Daily loss -	1.24,4

An Observation of Jupiter's *first Satellite.*

Sky remarkably clear and glass steady.

31st October, emerged by watch - - - - - -	h ′ ″ 6.00.45
Too slow at noon, - - - - - -	23 49,3
Loss till observation at 84″,4, - - - -	22,5
	Emersion, -	6.24.56,8
	Ephemeris, -	51.26
	Longitude in time,	5.33.30,8
	In degrees, -	° ′ ″ 83.22.42,0

KALINGAPATAM, 1784.

Observations by Lieutenant COLEBROOKE, *for time.*

☉ On meridian, November 7th, -	h ′ ″ 23.50.56,5		
Equation of E. A. - -	+ 6,8		
	23.51.03,3	slow, - -	8′.56″,7
β Cassiopææ on the meridian, -	8.49.48		
By calculation, -	9.00.01,6	slow, - -	10.13,6

Therefore the watch lost 1′.16″,9 in 9 hours, and 205′,06 daily.

N. B.

N.B. The watch had run down on the 5th, and the weather was changing from dry to cloudy, which ended in rain.

For Longitude.

An Emerſion of Jupiter'*s firſt Satellite.*

Glaſs ſteady, atmoſphere rather thick.

		h ′ ″
By watch emerged	- - - - - -	8.13.35
Too ſlow by the ſtar,	- - - - - -	+10.13,6
The ſtar paſſed, after the emerſion 36′; loſs for that time,	-	− 5,1
Emerſion,	- -	8.23.43,5
Ephemeris,	- -	2.47.01,0
Longitude in time,	-	5.36.42,5
		° ′ ″
In degrees,	- -	84.10.37,5

IECHAPOORE, 1782.

Obſervations by T. D. P.

Double altitudes of *Jupiter*, with the octant and artificial horizon.

Time.		*Angles.*
h ′ ″		° ′ ″
8.10.03	—	64.28.10
13.03	—	63.30.00
15.08	—	62.45.20
18.53	—	61.50.30
8.14.17 Mean,		31.34.15
Ref.		− 1.34
		31.32.41

		h ′ ″
Jupiter's R. A. at the time,	-	17.21.46,6
		° ′ ″
Declination	- -	23.02.04S.
		h ′ ″
☉ R. A. at the time,	-	11.55.08,2
Latitude by Colebooke, 1784, ſee Table.		
		° ′ ″
See obſervations at large,	-	19.06.45

From

From the above data, *Jupiter* had paffed the meridian 2h.45′.59″,2, and the time

was	-	h ′ ″ 8.12.37,6
Watch,	-	8.14.17
Too faft,	-	1.39,4

An Eclipfe of the Moon.

21ft September,	h ′ ″ 7.00.15	doubtful.
	01.40	begun certainly.
	02.40	ftrong fhadow came on.
	04.14	Penumbra touched a place which I name A.
	09.03	fhadow touched A.
	9.06.56	fhadow touched the limb at B.
	08.11	Penumbra going.
	10.12	limb not perfectly bright.
	11.20	end certainly, and at B.

By comparifon of the obfervations at A, it appears that the fhadow required 4′.49″ to move through the breadth of the Penumbra. By comparing thofe at B, it appears that 4′.24″ were then fufficient.

The mean of thefe will be very near the truth ; it is 4′.37′

Shadow came on, - - -	h ′ ″ 7.02.40
Advance of Penumbra, - -	− 04.37
Beginning of eclipfe, - -	6.58.03
Shadow touched the limb, - -	9.06.56
Retreat of Penumbra, - -	+04.37
End of eclipfe, - - - -	9.11.33

Duration

		h ′ ″
Duration obſerved,	- - -	2.13.30
Duration by ephemeris,	- -	2.08.30
		+05.00
By ephemeris end,	-	3.28
Beginning,	-	1.19.30
Duration,	-	2.08.30
Ephemeris middle,	-	2.23.45
Middle obſerved by watch,	-	8.04.48
Too faſt,	-	− 1.39,4
		8.03.08,6
Ephemeris,	-	2.23.45
Longitude in time,	-	5.39.23,6
		° ′ ″
In degrees,	-	84.50.54

GANGAM FORT, 1782.

Obſervations by T. D. P. *Latitude determined.*

		h ′ ″
4th September, horizon clear, octant,	- - - -	19.21.30
6th, Very hazy, by ſextant, and quadrant, both agreed,	-	19.21.03
16th, Sextant,	-	19.21.50
Octant,	-	19.19.50
Mean,	-	19.21.03

Theſe were taken from the top of the Chief's houſe, the ſea was the horizon, the height above the area of the fort was meaſured, but the height of that area was gueſſed at; the dip was taken correſponding to this height from the tables.

An

An Obfervation of Jupiter's *fourth Satellite.*

		h ′ ″
16th September, 1782, immerfion,	- - - -	6.45.27
The change of colour was noted at	-	6.44.04

Clouds prevented the obferving of the emerfion of this, and the immerfion of the firft which happened that night.

GANJAM CAMP, 1784.

Obfervations by Lieutenant COLEBROOKE.

		h ′ ″			
⊙ On the meridian, November 20th,	-	23.57.36,3			
Equation of E. A.	-	+ 05,5			
		23.57.41,8	flow,	-	2′.18″,2
⊙ On the meridian, 21ft,	- -	23.56.00			
Equation of E. A.		+ 05,5			
		23.56.05,5	flow,	-	3.54,5
⊙ On the meridian, 22d,	- -	23.54.15,0			
Equation of E. A.	-	05,4			
		23.54.20,4	flow,	-	5.59,6

* ε *Caffiopeæ*, 24th November.

	Firft Wire. h ′ ″	*Middle.* ′ ″	*Upper.* ′ ″		h ′ ″
Rifing, -	7.28.20	34.40	42.40		
Falling, -	9.35.53	29.35	21.37		
On the meridian, -	8.32.06,5	32.07,5	32.08,5	=	8.32.07,5
			By calculation,	-	8.39.51,2
			Slow,	-	7.43,7

Which compared with the laft folar obfervation, gives 91″,3 daily lofs.

An Emersion of Jupiter's *first Satellite.*

		h ′ ″
24th November, by watch emerged,	- - - -	6.37.35
Too slow by the star,	-	+ 7.43,7
Loss after the emersion, at 91″,3,	-	− 7,3
Emersion,	-	6.45.11,4
Ephemeris	-	1.04.39
Longitude in time,		5.40.32,4
		° ′ ″
In degrees,	-	86.08.06

JEHAUDJEPOOR, 1784.

Observations by Lieutenant COLEBROOKE.

		Middle.	*Upper.*		
		h ′ ″	′ ″		
17th December, * ε *Cassiopeæ* rising,	-	6.31.40	42.03		
falling,	-	8.05.53	55.31		
					h ′ ″
* On the meridian,	-	7.18.46,5	18.47	=	7.18.46,7
		By calculation,	-		7.54.48,7
			Watch slow,		36.02,0
		h ′ ″			
☉ On the meridian, 17th,	- -	23.23.59,3			
Equation of E. A.	-	+ 1			
		23.24.00	slow,	-	′ ″ 36.00

An Emersion of Jupiter's *first Satellite.*

		h ′ ″
By watch emerged,	- - -	6.21.25
Too slow by the *	-	36.02
Emersion,	-	6.57.27
Ephemeris,	-	1.11.50
Longitude in time,	-	5.45.37
		° ′ ″
In degrees,	-	86.24.15

SOOBUN-

SOOBUNREEKA RIVER CAMP, 1784.

Obſervations by Lieutenant COLEBROOKE.

N.B. Oppoſite Jellaſore, *on the* Ballaſore *ſide of the river.*

		h ′ ″			′ ″
☉ On the meridian, December 24th	-	23.19.34,1			
Equation of E. A.	- -	- ,7			
		23.19.33,4	ſlow,	-	40.26,6
		h ′ ″			
☉ On the meridian, December 25th	-	23.18.12			
Equation of E. A.	- -	- 1			
		23.18.11	ſlow,	-	41.49,0
Daily loſs, - 82″,4					

An Emerſion of Jupiter's *firſt Satellite.*

			h ′ ″
17th December, by watch emerged,	- - - -	-	8.12.42
Full ſplendor.	Too ſlow at the following noon,	-	40.26,2
$8^h.13'.50''$	Loſs after emerſion, at 82′,4	-	- 52
	Emerſion,	-	8.52.16,2
	Ephemeris,	-	3.04,14
	Longitude in time,	-	5.48.02,2
			° ′ ″
	In degrees,	-	87.00.33,0

An Emerſion of Jupiter's *ſecond Satellite.*

		h ′ ″
25th December, by watch emerged, - -	-	6.04.40
Watch ſlow,	-	+ 40.26,6
Loſs till obſervation, at 82″,4	-	+ 23,2
Emerſion,	-	6.45.29,8
Ephemeris,	-	55.57
Longitude in time,	-	5.49.32,8
		° ′ ″
In degrees,	-	87.23.12

A Com-

A Compariſon of the Obſervations for Longitudes, with correſponding Obſervations at different Places, to fix the Longitudes of thoſe which were undetermined.

By T. D. P.

CALCUTTA.

The obſervatory was at the Treaſury Gate in *Fort William.*

Lunar Eclipſes. h ′ ″

1776, July 30th, Immerſion at *Calcutta*, - 17.01.16

Greenwich, - 11.08.21 h ′ ″

5.52.55

As this was not of the beſt, I reject it.

1779, November 23d. I reject the beginning, becauſe, when compared with *Tycho* in the former part, it appears from a like compariſon of the *Greenwich* obſervations, that it is erroneous a full minute. The firſt *Copernicus* is alſo rejected. And by comparing the end doubtful with *Tycho* and *Copernicus* of the latter part in both ſets, it appears to be the obſervation that muſt be compared with the end at *Greenwich*.

	Calcutta.	*Greenwich.*	*Longitude.*
	h ′ ″	h ′ ″	h ′ ″
The body of Tycho touched,	12.35.30	6.42.29	5.53.01,0
Paſſed,	36.53	43.36	17,0
Immerſion,	13.01.41,3	7.08.08	33,3
Emerſion,	14.40.13,3	8.46.23	50,3
Grimaldi touched,	43.06,3	49.45	21,3
The middle of Copernicus,	15.02.44,1	9.08.59,5	44,6
The body of Tycho touched,	04.56	11.39	17,0
Paſſed,	06.23	12.49	34,0
The end,	15.39.45,6	9.46.09	36,6

Mean, in time, 5.53.28,3

° ′ ″

In degrees, 88.22.04,5

Jupiter's *Satellites.*

From the beginning in 1774, till the 27th December, 1777, the obſervations were made with a middling 18-inch reflector, I allow 24″ to compare it with the large reflector at *Greenwich*, and 12″ for their refractor. The compariſon is of actual correſponding obſervations, except in two caſes, in which the *Calcutta* obſervations are one revolution later. The longitudes of *Paris* and *Stockholm* are taken from WARGENTIN, Phil. Tranſ. vol. 67. LUNDEN, from thirty-three correſponding obſervations found in that ſame paper: of *Chiſlehurſt*, from WOLLASTON, vol. 74. Of *Geneva*, *Oxford*, and *Marſeilles*, from PIGOT, vol. 68 and 76. *Nagpoore* and *Chunargur*, were communicated to me by Lieutenant EWART, of the *Bengal* eſtabliſhment, who obſerved at each place a conſiderable time.

Date.	Place.	Time.	Correction for Longitude or Glass.	Times correct.	Longitude. In Time.	Longitude. In Degrees.
		h ′ ″	h ′ ″	h ′ ″	h ′ ″	° ′ ″
1774, October 14th,	Calcutta,	12.32.25	1st Sat. Im. + 24	12.32.49		
	Stockholm,	07.52.00	—1.12.21	6.39.39		
					5.53.10,0	
21st.	Greenwich,	° ′ ″	1st Sat. Im.	8.35.00		
	Paris,	8.44.47	— 09.25	22		
	Geneva,	8.59.20	— 24.05	15		
	Oxford,	8.30.26	+ 4.59	25		
		Immersion,	Mean,	8.35.15,5		
			Add one Revolution 1,	18.28.49		
			Day 23d,			
				3.04.45		
23d.	Calcutta,	8.57.15	1st Sat. Im. + 24″	8.57.39		
					5.53.34,5	
December 31st.	Calcutta,	11.25.47	— 24″ Em.	11.25.23		
	Lunden,	6.25.05	— 52.55	5.32.10		
					5.53.13,0	
1776, November 11th.	Greenwich,	1st Sat. Im.	N.B. Refractor,	13.37.32		
			Add one Revolution 1,	18.28.06		
			Day, 13th,			
				8.05.38		
13th.	Calcutta,	13.58.56,3	1st Sat. Im. + 12″	13.59.08,3		
					5.53.30,3	
17th.	Calcutta,	15.31.51,3	3d Sat. Im. + 12	15.32.03,3		
	Chislehurst,	9.38.48,5	— 19	9.38.29,5		
					5.53.33,8	
December 18th.	Calcutta,	15.58.21	2d Sat. Im.	15.58.21		
	Marseilles,	10.25.54	— 21.25	10.04.29		
					5.53.52,0	
			Mean by Jupiter's Satellite, -		5.53.29	
			By Lunar Eclipses, - -		5.53.28	
			Result—Longitude of Calcutta, -		5.53.28,5	88.22.07,5

Date.	Place.	Time.	Correction for Longitude or Glass.	Times correct.	Longitude. In Time.	Longitude. In Degrees.
		A Lunar Eclipse.		h ′ ″	h ′ ″	° ′ ″
1782, September 21st.	Ichapoore,	The shadow touched the limb.		9.05.16,6		
		h ′ ″	h ′ ″			
	Nagpoore,	8.44.22	—5.18.46	3.25.36		
		Jupiter's Satellites.			5.39.40,6	84.55.09,0
October 9th.	Kossim Kotta,	1st Sat. E.		7.09.48		
	Nagpoore,	6.56.43	—5.18.46	1.37.57		
					5.31.51,0	82.57.45
1784, September 5th.	York,	9.08.54	+ 4.31	9.13.25		
	Greenwich,		Refractor,	15		
			{ + glass, 13			
	Paris,	9.22.18	{ — 9.25	06		
			1st Sat. E. Mean,	9.13.15,5		
	Beemulwilsa,	14.47.01,1	— 12	14.46.49,1		
					5.33.34,0	83.23.30,0
				8.23.43,5		
November 8th.	Kalingapatam,		1st. Sat. E.	2.47.09		
	Chunargur,	8.19.45	—5.32.26		5.36.34,5	84.08.37,0

Observations *at large for determining the Latitudes of* Places.

Phænomenon and Face of the Quadrant.	*Date.*	Arch of 96. *Reading.*	Arch of 96. *Value.*	*Arch of 90.*	*Refraction or Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the observation.*	*Name of the place and its correct Latitude.*
	1783.	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	
α Aquilæ, E.	Oct. 9th,	4. 3.28,3	4.39.36,2	4.40.00	4,3	4.39.52,4	8.18.24,7N.	12.58.17,1	Viperee.
W.	11th,	6–3.01,5	4.54.39,2	4.55.00	5	4.54.54,2		13.13.18,9	
E.	12th,	4. 3.28	4.39.29,6	4.40.00	4,3	4.39.49,1		12.58.13,8	
α Cygni, W.	9th,	33. 1.20,5	31.19.19,3	31.19.10	35,3	31.19.50	44.30.53,8N.	13.11.03,8	
W.	11th,	33. 1.18,5	31.18.26,5	31.18.30	35,3	31.19.03,6		13.11.50,2	
Fumulhoot, E.	11th,	46. 2.18	43.43.32	43.44.00	54,5	43.44.40,5	30.45.43 S.	12.58.57,5	
α Pegasi, E.	11th,	2–3.12	1. 5.02,4	1. 5.00	1	1. 5.02,2	14. 2.42,8N.	12.57.40,6	
W.	11th,	0. 3.21	0.51.11,3	0.51.30,0	0,8	0.51.21,5		13.11.21,3	
4 Stars, E.								12.58.17,2	Viperee,
4 Stars, W.								13.11.53,5	° ′ ″ 13.05.05,35
Algenib, E.	Nov.	1. 0.00	0.56.15	0.57.00	0,9	0.56.38,4	13.58.34,7N.	13. 1.56,4	Trivatore,
W.	21st.	0. 3.00	0.42.11,3	0.42.30	0,7	0.42.21,3		13.16.13,3	° ′ ″
Pole at 10 P.		79. 3.16	74.53.18	74.53.30	210,0	75.00.12,2	88. 9.08	13.08.55.8	13. 9.00,4
					+				
				Collim.	428,0				
	1784.				—				
	April		Below the pole,		228,0				
α Leonis, E.	23d.	0. 1.04	0.15.49,2	0.15.55	0	0.15.55,3	13.00.53 N.	13.16.45	North side of Cortelare river,
α Urs.Maj. W.		52. 3.29	49.39.56	49.40.40	67,0	49.41.25	62.54.43 N.	13.13.18	° ′ ″ 13.15.01,5
α Leonis, W.	25th,	0. 2.09	0.32.05	0.32.40	0,5	0.30.43	13.00.53 N.	13.31.34	Arambaukum,
					—				° ′ ″
				Collim.	102				13.31.36
α Urs.Maj. W.	26th,	52. 1.29	49.11.48,4	49.12.20	67,0	49.13.11,2	62.54.43 N.	13.41.32.2	Akamapett,
α Virginis, E.		25. 1.01	23.40.45	23.41.00	25	23.41.17,5	10. 1.46 S.	13.39.31.5	° ′ ″ 13.40.32
α Leonis, W.	27th,	0. 3.10,5	0.46.48	0.47.00	0,8	0.46.54,8	13. 0.53 N.	13.47.47.8	Akarumpauk,
γ Leonis, W.		7. 2.14	7. 8.01,6	7. 7.20	7	7. 7.48,8	20.55.38 N.	13.47.50	° ′ ″ 13.47.49
γ Leonis, W	28th,	7. 1.20	6.56.36	6.57. 0	7	6.56.55		13.40.43	Nayrpett,
α Virginis, E.		25.20.01	23.54.49	23.55.00	25	23.55.19	10. 1.46 S.	13.53.33	° ′ ″ 13.56.08
α Urs.Maj. W.	29th,	52. 0.12,5	48.50.29,6	48.50.50	65	48.51.45	62.54.43 N.	14. 2.58	Korware,
α Virginis, E.		25. 2.25	24. 5.22	24. 5.50	25	24. 6.01	10. 1.46 S.	14. 4.15	° ′ ″
γ Leonis, W.	30th,	7. 1. 3	6.49.07,2	6.49.10	6,5	6.49.15	20.55.38 N.	14. 6.23	14. 5.12,6
α Urs.Maj. W.		52. 0. 9	48.48.57	48.49.40	65	48.50.23	62.54.43 N.	14. 4.20	
α Virginis, E.		25. 2.23	24. 4.29	24. 5.10	25	24. 5.15	10. 1.46 S.	14. 3.29	Vincateechil-
α Urs.Maj. W.	May	51. 3.04	48.32.42	48.32.00	64	48.33.25	62.54.43 N.	14.21.18	lum, °
α Virginis, E.	1st.	25. 3.26	24.19.52	24.20.00	26	24.20.22	10. 1.46	14.18.36	14.19.57

OBSERVATIONS *at large for determining the Latitudes of* PLACES.

Phœnomenon and Face of the Quadrant.	*Date.*	ARCH OF 96. *Reading.*	*Value.*	*Arch of 90.*	*Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the observation.*	*Name of the place and its correct Latitude.*
	1784.	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	
δ Urf. Maj. W	May	46. 2.17	43.43.06	43.44.00	54	43.44.27	58.13.58 N.	14.29.31	Pinnare River,
ζ Urf. Maj. W.	3d,	44. 1.10	41.43.27,4	41.33.10	50,3	41.34.09	56. 3.23 N.	14.29 14	North Bank,
α Virginis, E.		26. 0.15	24.29.05,5	24.29.10	26	24.29.33,7	10. 1.46 S.	14.27.47,7	14.28.35
α Virginis, E.	10th,	26. 2.22	25.00.17,6	25.00.40	26,2	25.00.55		14.59.09	Ollore*,
ζ Urf. Maj. W.		44. 1.20	41.37.51	41.37.20	49	41.38.24,5	56. 3.23 N.	14.24.58,5	14.42.03,8
δ Urf. Maj. W.	12th,	46. 0.22	43.17.10	43.17.10	53	43.18.03	58.13.58 N.	14.55.55	Mooaumillo-
α Virginis, E.		26. 1.28	24.48.52	24.48.50	25	24.49.16	10. 1.48 S.	14.47.28	dooro,
ζ Urf. Maj. W.		43. 3.15	41. 7.32	41. 8.10	44	41. 8.35	56. 3.23 N.	14.54.48	
α Virginis, E.	13th,	26. 1.30	24.49.48,5	24.50.00	25	24.50.19,3	10. 1.48 S.	14.48.31,3	
ζ Urf. Maj. W.		43. 3.14	41. 7.05,5	41. 7.10	44	41. 7.51,7	56. 3.23 N.	14.55.31,3	14.51.42,1
δ Urf. Maj. W.	19th,	45. 2.07	42.42.27,1	42.42.10	53	42.43.11,5	58.13.58 N.	15.30.46,5	Ongle, proper-
ε Urf. Maj. W.		44. 1.17	41.36.32	41.36.00	50	41.37.06	57. 8.02,5 N.	15.30.56,5	ly Wungole,
α Virginis, E.		27. 0.22	25.28.25	25.29.00	27	25.29.09,5	10. 1.48 S.	15.27.21,5	
ζ Urf. Maj. W.		43. 0.27	40.30.37	40.30.30	49	40.31.22,5	56. 3.23 N.	15.32.00,5	15.29.18,2
α Virginis, E.	20th,	27. 1.05	25.35.01	25.35.00	27	25.35.27,5	10. 1.48 S.	15.33.39,5	Chicoortee,
ζ Urf. Maj. W.		43. 0.17	40.26.13	40.26.05	49	40.26.58	56. 3.23 N.	15.36.25	15.35.44,5
α Virginis, E.	22d,	27. 1.05	25.35.01	25.35.00	27	25.35.27,5	10. 1.48 S.	15.33.39,5	Yenmunbender,
ζ Urf. Maj. W.		43. 0.13	40.24.29	40.25.00	49	40.25.33,4	56. 3.23 N.	15.37.49,6	15.46.27,5
κ Urf. Maj. W.	23d,	36. 3.15	34.33.37	34.33.50	39	34.34.22,5	50.23.42 N.	15.49.09	Vantipollam,
α Libræ, E.		32. 3.21	30.51.25	30.51.05	34	30.51.49	15. 8 03 S.	15.43.46	15.46.27,5
α Virginis, E.	25th,	27. 2.15	25.53.28	25.54.00	28	25.54.12	10. 1.48 S.	15.52.24	Baupetla,
ζ Urf. Maj. W.		42. 3. 3	40. 6.00	40. 5.50	48	40. 6.43	56. 3 23 N.	15.56.40	15.54.32

LIEUTENANT COLEBROOKE had by this time acquired the art of uſing the quadrant, and his obſervations will appear where I did not take any. The next is his, and where his are ſubſtituted, they will be marked C. He did obſerve Chicoortee, the reſult I had entered in my book, it was 15°.34′.10″ but his obſervation was loſt.

κ Urf. Maj. W.	26th,	36. 2.16	34.20.09,4	34.20.00	39	34.20.43,7	50.23.42 N.	16.02.58,3	Chundole,
α Libræ, E.		33. 0.20	31. 5.02	31. 5.00	34	31. 5.35	15. 8.03 S.	15.57.32	16. 0.15,2 C.
κ Urf. Maj. W.	28th,	36. 1.22	34. 8.44	35. 8.05	38	34. 9.02,5	50.23.42 N.	16.14.39,5	Sicacollum, on the North Bank of the Kiſtna,
α Libræ, E.		33. 1.15	31.16.54	31.17.00	34	31.17.31	15. 8.03 S.	16. 9.28	16.12.04,3

* The quadrant was pulled to pieces at Pinnare Camp, and the line of collimation had not been adjuſted; it was performed before it was next uſed.

OBSERVATIONS *at large for determining the Latitudes of* PLACES.

		Arch of 96.							
Phænomenon and Face of the Quadrant.	*Date.*	*Reading.*	*Value.*	*Arch of 90.*	*Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the observation.*	*Name of the place and its correct Latitude.*
	1784.	D.SD.N.	° ′ ″	° ′ ″	′ ″	° ′ ″	° ′ ″	° ′ ″	
ε Urs. Maj. W.	May 29th,	43. 1.18	40.40.43	40.39.55	49	40.41.08	57. 8.02,5 N.	16.26.54,5	Moodenoore,
α Virginis, E.		28. 0.21	26.24.14	26.23.30	29	26.24.21	10. 1.48 S.	16.22.33	° ′ ″ 16.24.38,8 C.
α Virginis, E.	June	28. 1.28	26.41.22	26.42.00	29	26.42.10		16.40.22	Ellore,
ζ Urs. Maj. W.	1st.	41. 3.22	39.18.16	39.18.10	48	39.19.10	56. 3.25 N.	16.44.13	16.42.17,5 P.
ε Urs. Maj. W.		43. 0.08	40.22.15,9	40.22.20	49	40.23.07	57. 8.02,5 N.	16.44.55,5	
η Urs. Maj. W.		35. 3.17	33.38.24,5	33.38.40	37,7	33.39.10	50.23.42 N.	16.44.32	
α Libræ, E.		33. 3.22	31.48.06,3	31.48.10	35	31.48.43,2	15. 8.04 S.	16.40.39,2	° ′ ″ 16.42.41,5 C.
☉ Up. L. W.	4th,	5. 2.20	5.18.10	5.18.40	5,0	5.34.18	22.32.32 N.	16.58.14 P.	Soolaurum,
				Semidia.	+ 15.49				
				Parallax,	— 1,0				
α Virginis, E.		28. 2.28	26.55.26	26.55.20	29	26.55.52	10. 1.48 S.	16.54.04 C.	° ′ ″ 16.56.08,5
α Virginis, E.	12th,	28. 3.02	26.58.04	26.57.05	29	26.58.03,5		16.56.15,5	Rajahmundree,
ζ Urs. Maj. W.		41. 2.15,5	39. 1.11,2	39. 1.20	46	39. 2.01,6	56. 3.23 N.	17. 1.12,4	° ′ ″ 16.58.43,6 P.
κ Urs. Maj. W.	12th,	35. 2.09	33.20.50	33.21.00	36	33.21.31	50.23.42 N.	17. 2.11	
α Libræ, E.		34. 0.23	32. 2.44	32. 2.40	35	32. 3.17	15. 8.04 S.	16.55.13	16.58.42 C.
κ Urs. Maj. W.	13th,	35. 1.29	33.15.33	33.15.00	35,5	33.15.52	50.23.42 N.	17. 7.50	Rajahnagur,
β Libræ, E.		27. 1.07	25.35.53	25.35.00	27	25.35.53	8.34.33 S.	17. 1.20	° ′ ″ 7. 4.35 C.
κ Urs. Maj. W.	14th,	35. 1.29	33.15.33,5	33.15.55	37	33.16.21	50.23.42 N.	17. 7.21	Peddapore,
α Draconis, W.		51. 2.00	48.16.52,5	48.16.10	62,7	48.17.34	65.24.36 N.	17. 7.02	
α Libræ, E.		34. 1.18	32.10.05	32. 9.30	34,5	32.10.22	15. 8.04 S.	17. 2.18	
β Libræ, E.		27. 1.07	25.35.53,3	25.34.40	25,4	25.36.12	8.34.33 S.	17. 1.39	° ′ ″ 17. 4.35 P.
β Scorpii, E.	18th,	38. 2.20	36.14.25	26.13.40	41,5	36.14.44	19.12.01,6 S.	17. 2.42	
γ Draconis, W.		36. 2.24	34.23.40	34.24.00	39,0	34.24.29	51.31.18 N.	17. 6.49	17. 4.45,5 C.
α Virginis, E.	20th,	28. 3.27	27. 8.59,7	27. 8.30	29,0	27. 9.13,7	10. 1.48 S.	17. 7.26	Gooloopool-
β Libræ, E.		27. 1.19	25.41.09,7	25.41.30	28,0	25.41.48	8.34.33 S.	17. 7.15	loore,
ζ Urs. Maj. W.		41. 1.30	38.53.30	38.53.20	44,0	38.54.09	56. 3.33 N.	17. 9.05	
κ Urs. Maj. W.		35. 1.23	33.12.55,2	33.12.50	37	33.13.15	50.23.42 N.	17.10.27	° ′ ″ 17. 8.33,5 C.
κ Urs. Maj. W.	21st.	35. 1.16	33. 9.50,6	33. 9.20	37	33.10.12	50.23.42 N.	17.13.30	Tonding and Matoor,
α Libræ, E.		34. 1.39	32.19.18	32.20.00	35	32.20.14	58.18.04 S.	17.12.10	° ′ ″ 17.12.45 C.
β Libræ, E.	22d,	27. 2.10	25.51.16	25.50.20	28	25.53.06	8.34.33 S.	17.18.33	Suteawaurum,
		From 18th to 20th June			+ 1.50				° ′ ″ 17.18.33 C.
α Coronæ Borealis, W.	24th,	10. 2.02	9.51.30	9.50.40	10	9.51.15	27.27.03,5 N.	17.35.48,5	Ellmuchillee,
β Scorpii, E.		39. 0.19	36.42.06	36.41.50	43	36.42.41	19.12.01,6 S.	17.30.39,4	° ′ ″ 17.33.14 C.

OBSERVATIONS *at large for determining the Latitudes of* PLACES.

Phænomenon and Face of the Quadrant.	*Date.*	ARCH OF 96. *Reading.*	*Value.*	*Arch of 90.*	*Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the Observation.*	*Name of the place and its correct Latitude.*
	1784.	D.SD.N.	° ′ ″	° ′ ″	′ ″	° ′ ″	° ′ ″	° ′ ″	
α Coronæ Borealis, W.	June 27th,	10. 1.08	9.40.04,7	9.39.40	9,6	9.40.02	27.27.03,5 N.	17.47.01,5	Sobaurum,
β Scorpii, E.	July 9th,	39. 1.23,5	36.58.08,4	36.57.20	43	36.58.27,2	19.12.02 S.	17.46.25,2	17° 46′ 59″,2 C.
α Scorpii, E.	12th,	46. 2.11	43.40.27,6	43.41.00	55	43.41.39	25.56.12 S.	17.45.27	These were made with difficulty amongst clouds and winds, but they were all that could be had.
⊙ Up. L. W.		5.04.12	3.50.16,4	3.50.00 Ref.& Par. Semedia.	+ 3,6 + 15.47	4. 5.59	27.55.02 N.	17.49.03	
α Lyræ, W.	Sept.	22.00.29	20.50.14	20.49.40	33	20.50.30	38.35.26,3 N.	17.44.56,3	Vizacpatam,
β Lyræ, W.	8th,	16.01.20	15.22.51	15.22.10	15	15.22.45,5	33.07.16 N.	17.44.30,5	
α Aquilæ, E.		9.03.27	9.20.18,2	9.20.00	9	9.20.18,1	8.18.32,5 N.	17.38.50,6	
β Aquilæ, E.		12.02.05,5	11.45.33	11.45.10	12	11.45.34	5.53.08,3 N.	17.38.42,3	17° 41′ 45″
α Coronæ Borealis, W.	July 14th,	10. 0.16	9.29.32	9.28.50	9,5	9.29.20,5	27.27.03,5 N.	17.57.43,[illegible]	Beemulwilsa Camp. A clear night,
γ Draconis, W.		35. 3.07	33.34.01	33.33.10	37,5	33.34.13	51.31.18 N.	17.57.05	
α Scorpii, E.		39. 2,03	37. 3.11	37. 2.40	43	37. 3.38,5	19.12.02 S.	17.51.36,5	17° 54′ 15″ C.
β Scorpii, E.		46. 2.23	43.45.44	43.46.00	55	43.46.47	25.56.12 S.	17.50.35	Simachillum,
β Libræ, E.		28. 0.08	26.18.31	26.19.00	20,5	26.19.14	8.34.33 S.	17.44.41	
α Coronæ Borealis, W.	8th,	10. 1.05,5	9.38.59	9.38.40	9,5	9.38.59,0	27.27.03,5 N.	17.48.04,5	17° 46′ 28″,3 C.

The four following Observations were taken by a quadrant made by RAMSDEN, eighteen inches radius, which shewed Altitudes,

α Lyræ, W.	Aug.	73. 3.10	69.17.13,6	69.17.35	—22	69.17.02,3	38.35.26,1 N.	17.52.28,4	Beemulwilsa,
β Lyræ, W.	29th,	79.03.00,9	74.45.47,3	74.46. 0	—15,6	74.45.38	33.07.16 N.	17.52.54,0	Head Quarters,
α Aquilæ*, E.		85.03. 2	80.24.24	80.24.50	—10	80.24.27	8.18.32 N.	17.54. 5	
β Aquilæ†, E.		83.00,12	77.58.32	77.58.47	—12	77.58.28	5.53.08 N.	17.54.40	17° 53′ 32″ P.
α Draconis, W.	8th,	35.03.11	33.35.46,3	33.35.00	38	33.36.01	51.31.18 N.	17.55.17	
α Lyræ, W.		22.00.04	20.39.16	20.38.30	20	20.39.13	38.35.26 N.	17.56.13	
α Lyræ, W.	9th,	22.00.05	20.39.42	20.39.00	20	29.39.41		17.55.45	
ɩ Sagittarii, E.		55.03.08	52.19.27,3	52.18.50	75	52.20.18,6	34.27.59,5 S.	17.52.29	
α Aquilæ, E.	28th,	10.00.23,5	9.32.50	9.33.00	10	9.33.05	8.18.32,5 N.	17.51.37,5	Head Quarters, Cantonments at Beemulwilsa,
ɩ Sagittarii, E.	31st,	55.03.07	52.19.01	52.18.40	75	52.20.06	34.27.59,5 S.	17.52.06,5	The Mean, - 17° 53′ 51″ C.
α Lyræ, W.		22.00.06	20.40.09	20.39.30	20	20.40.15	38.35.26 N.	17.55.11	
α Cygni, W.	Sept.	28.01.13	26.34.46,6	26.35.00	29	26.35.22	44.31.05,3 N.	17.55.43,3	
β Aquarii, E.	3d,	25.03.30	24.21.37,3	24.22.00	25	24.22.14	6.30.33 S.	17.51.41	
α Cephei, W.	27th,	46.02.22	43.45.17,3	43.45.00	55	43.46.04	61.40.42 N.	17.54.38	
β Aquarii, E.		26.00.00	24.20.30	24.22.20	25	24.22.50	6.30.33 S.	17.52.17	
6 North Stars,								17.55.28	
6 South Stars,								17.52.14	

* From the reading of α Aquilæ, 29th August, subtract 48″, † and from β Aquilæ 45″

Observations *at large for determining the Latitudes of* Places.

From henceforward all the Obfervations were taken by Lieutenant Colebrooke.

Phænomenon and Face of the Quadrant.	*Date.*	Arch of 96. *Reading.*	Arch of 96. *Value.*	*Arch of 90.*	*Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the Obferv ation.*	*Name of the place and its correct Latitude.*
	178[?]	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	
α Cephei, W	Oct.	46.01.24	43.32.06,8	43.31.30	53	43.32.42.3	61.40.42,2N.	18.08.00	Vizianagur Pa-
β Aquarii, E	22d,	26.00.26	24.33.55,6	24.33.30	26	24.34.08.8	6.30.33 S.	18.03.35,8	lace,
α Cygni, W.	23d,	28.00.15,8	26.21.35,5	26.22.00	28	26.22.15.8	44.31.05,3N.	18.08.49,6	
α Cephei, W.		46.01.25	43.32.32,9	43.31.46	54	43.33.03.5	61.40.42,2N.	18.07.38,7	° ′ ″
β Aquarii, E.		26.00.26	24.33.55,6	24.33.35	26	24.34.11.3	6.30.33 S.	18.03.38,3	18.05.52,3
α Cygni, W.	25th,	28.00.27	26.26.51,9	26.27.00	28	26.26.24	44.31.05,2N.	18.03.41,2	Brimfing,
α Cephei W.		46.02,00	43.36.30,2	43.35.50	54	43.37.04.1	61.40.42,2N.	18.03.38,1	° ′ ″
β Aquarii, E.		26.00.19	24.30.51	24.30.00	26	24.30.51.5	6.30.33 S.	18.00.18,0	18.01.59
7 Lacertæ, W.	26th,	33.01.23	31.20.25,2	31.20.00	34,4	31.20.47	49.10.48 N.	17.50.01	Santipollum,
Fumulhoot, E.		51.03.07	48.34.00,8	48.33.30	64	48.34.49.5	30.45.25,6 S.	17.49.23,8	° ′ ″ 17.49.42,4
α Cephei, W.	31ft,	46.02.00	43.35.37,5	43.35.00	54	43.36.13	61.40.42,2N.	18.05.29,2	Chintulwilfa,
β Aquarii, E.		26.00.18	24.30.24,6	24.30.00	25,7	24.30.38	6.30.33 S.	18.00.05	° ′ ″ 18.02.17,1
α Cephei, W.	Nov.	46.01.26	43.32.59,3	43.32.50	54	43.33.48.6	61.40.42,2N.	18.06.53,6	Narrainpoore,
β Aquarii, E.	1ft.	26.00.23	24.32.36,5	24.32.20	26	24.32.54.3	6.30.33 S.	18.02.21,3	
Fumulhoot, E.		52.00.08	48.48.30,9	48.48.30	65	48.49.35.5	30.45.25,6 S.	18.04.08,9	
β Caffiopææ, W.		42.01.29	39.49.18,4	39.49.00	48	39.49.57.2	57.57.50 N.	18.07.52,8	° ′ ″ 18.05.18,7
α Aquarii, E.	3d,	20.02.26	19.24.33,5	19.24.00	20	19.24.36.8	1.21.30,6 S.	18.03.06.2	Kundawilfa,
7 Lacertæ, W.		33.00,11	31.01.05,1	31.01.30	34	31.01.51.6	49.10.48 N.	18.08.56,4	° ′ ″ 18.06.01,3
α Aquarii, E.	4th,	20.03.10	19.31.34,9	19.31.30	20	19.31.52.5	1.21.30,6 S.	18.10.21.9	Timorgudha,
7 Lacertæ, W.		33.00.00	30.56.15	30.55.20	34	30.56.21.5	49.10.48 N.	18.14.26.5	° ′ ″ 18.12.24,2
α Andromedis, W.	5th,	10.00.27	9.34.22	9.34.20	10	9.34.31	27.53.56 N.	18.19.25	Sicacole Camp,
γ Pegafi, E.		4.02.06	4.15.45,7	4.15.00	4	4.15.27	13.59.10 N.	18.14.37	° ′ ″ 18.17.01
α Cephei, W.	7th,	46.00.21	43.16.43,7	43.17.00	53	43.17.45	61.40.42,2N.	18.22.57,2	Kalingapatam Camp,
Famulhoot, E.		52.01.11	49.03.54	49.04.00	65	49.05.02	30.45.25,6 S.	18.19.36.4	° ′ ″ 18.21.16,8
Fumulhoot, E.	9th,	52.01.28	49.11.22,1	49.11.20	64	49.12.25		18.26.59.4	Kulliparoo,
α Andromedis, W.		10.00.02	9.23.22,4	9.23.30	10	9.23.36	27.53.53 N.	18.30.17	° ′ ″
γ Pegafi, E.		4.03.02	4.28.04	4.27.30	5	4.27.52	13.59.07 N.	18.26.59	18.28.39
α Andromedis, W	11th,	9.02.27	9.06.14.5	9.05.40	10	9.06.07	27.53.53 N.	18.47.46	Coffeboogaum,
γ Pegafi, E.		5.00.05	4.43.27	4.43. 0	4,5	4.43.18	13.59.07,5N.	18.42.25.5	° ′ ″ 18.45.05,8
Fumulhoot, E.	14th,	53.00.10	49 45.38.7	49.45.30	67	49.46.41.4	30.45.22,5 S.	19.01.19	Kutwaul Ta-
β Caffiopææ, W.		41.01.28	38.52.37.1	38.52.00	56	38.53.04.6	57.57.46,7N.	19.04.42.1	lanb, ° ′ ″ 19.03.00,5

OBSERVATIONS *at large for determining the Latitudes of* PLACES.

Phænomenon and Face of the Quadrant.	*Date.*	ARCH OF 96. *Reading.*	*Value.*	*Arch of 90.*	*Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the observation.*	*Name of the place and its correct Latitude.*
	1784.	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	
α Andromedis, W.	Nov. 15th,	9.01.10	8.44.42,5	8.45.00	8,7	8.45.00	27.53.59 N	19.08.59	Ichapoor,
γ Pegasi, E.		5.01.23	5.05.25,3	5.05.00	5	5.05.17,5	13.59.13,3 N	19.04.30,8	° ′ ″ 19.06.45
7 Lacertæ, W.	16th,	31.03.10	29.50.20	29.49.40	33	29.50.33	49.10.45 N	19.20.12	Jurrampoore,
Fumulhoot, E.		53.01.15	50.01.54,3	50.02.00	67	50.03.04.2	30.45.22,5 S	19.17.41,	° ′ ″ 19.18.57
7 Lacertæ, W.	17th.	31.03.13	29.51.39,1	29.51.00	33	29.51.52.6	49.10.45 N	19.18.52,4	Muntoor Cottah,
Fumulhoot, E.		53.01.10	49.59.40,4	49.59.30	67	50.00.42.2	30.45.22,5 S.	19.15.19,7	° ′ ″ 19.17.05,5
E.	18th.	53.01.24	50.05.51,6	50.05.30	67	50.06.48		19.21.25,5	Ganjam Camp,
β Cassiopææ, W.		41.00.13	38.31.58	38.31.00	46	38.32.15	57.57.53 N.	19.25.38	° ′ ″ 19.23.32
Fumulhoot, E.	25th,	53.02.06	50.12.00,7	50.12.00	67	50.13.07.5	30.45.22,5 S.	19.27.45	Piaghee,
β Cassiopææ, W.		41.00.03	38.27.34,7	38.26.50	45,6	38.27.58	57.57.50,0 N.	19.29.55	° ′ ″ 19.28.50
Fumulhoot, E.	26th,	43.02.14	50.15.31,7	50.15.30	67	50.16.38	30.45.22.5 S.	19.31.15,5	Maloodee,
β Cassiopææ, W.		40.03.25	38.23.11	38.23.10	45,6	38.23.56,1	57.57.53 N.	19.33.57	° ′ ″ 19.32.36,5
Fumulhoot, E.	29th,	53.03.04	50.25.11,8	50.24.40	67	50.26.02	30.45.22.5 S.	19.40.40,5	Manickpatam,
α Andromedis, W.		8.02.29	8.10.52,2	8.10.50	8	8.10.59.1	7.53.59.0 N.	19.43.00	
α Cassiopææ, W		38.00.01	35.37.56,4	35.37.30	40,8	35.38.24	55.21.23.0	19.42.59	° ′ ″ 19.41.50
Fumulhoot, E.	Dec.	53.03.21	50.32.40	50.32.30	67	50.32.42	30.45.22.5 S.	19.48.19,5	Jaggernaut,
γ Pegasi, E.	4th,	6.00.21	5.46.43,7	5.46.30	6	5.46.43	13.59.13.3 S.	19.45.56,3	
α Cassiopææ, W.		37.03.22	35.33.06,3	35.32.40	41	35.33.34,2	55.21.23 N.	19.47.49	
α Andromedis, W.		8.02.12	8.03.26	8.03.00	8	8.03.21	27.53.59 N.	19.50.38	° ′ ″ 19.41.50
α Andromedis, W.	7th,	8.01.21	7.53.17,5	7.53.20	8	7.53.27	27.53.59 N	20.00.32	Ahmetpoore,
α Cassiopææ, W.		37.02.26	35.20.48	35.21.00	40	35.21.34	55.21.23 N	19.59.49	
ι Cassiopææ, W.		45.01.24	42.35.52	42.36.00	52	42.36.44	62.36.07 N.	19.59.23	
γ Pegasi, E.		6.01.06	5.54.12	5.54.00	6	5.54.12	13.59.13.3 N.	19.53.25,3	
η Ceti, E.		33.01.05	31.12.30,7	31.12.00	34	31.12.49.4	[illegible].19.35 S.	19.53.14,4	° ′ ″
θ Ceti, E.		31.00.17	29.11.13,3	29.10.30	32	29.11.23.6	9.17.47 S.	19.53.36,6	19.56.40,2
α Cassiopææ, W.		37.02.05	35.11.34,3	35.11.00	40	35.11.57	55.21.23 N.	20.09.26	Peeply,
δ Cassiopææ, W.	8th,	41.02.07	38.57.27,1	38.57.00	46	38.57.59.6	59.06.56 N.	20.08.56	° ′ ″
η Ceti, E.		33.02.00	31.24.22,6	31.24.00	34,4	31.24.46	11.19.35 S.	20.05.11	20.07.11
α Andromedis, W.	9th.	8.00.08	7.33.31	7.33.00	7,5	7.33.23	27.53.59 N.	20.20.36	Ballunta,
γ Pegasi, E.		6.02.22	6.15.18	6.15.30	6	6.15.30	13.59.13 N.	20.14.43	° ′ ″ 20.17.40

OBSERVATIONS *at large for determining the Latitudes of* PLACES.

Phænomenon and Face of the Quadrant.	*Date.*	ARCH OF 96.		*Arch of 90.*	*Equation applied.*	*Zenith Distance corrected.*	*Declination.*	*Latitude by the observation.*	*Name of the place and its correct Latitude.*
		Reading.	*Value.*						
	1784. Dec.	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	Sowlagunda, near Kuttack,
γ Cassiopææ, W.	10th,	41.02.22	39.04.02,6	39.03.30	46	39.04.30	59.52.54 N.	20.28.21,7	° ′ ″
η Ceti, E.		33.03.13	31.43.59	31.43.30	35	31.44.20	11.19.35 S.	20.24.45	20.26.33,5
ι Cassiopææ, W.	15th,	44.02.16	41.50.09,4	41.49.40	51	41.50.45,7	62.36.07 N.	20.45.21,3	Koomereah River, north side, ° ′ ″
α Piscium, E.		20.00.29	18.57.44,7	18.57.40	19	18.58.01,4	1.43.03 N.	20.41.04,4	20.43.13
α Cassiopææ, W.	17th.	36.02.20	34.26.18,5	34.26.00	39	34.26.48,3	55.21.23 N.	20.54.34,7	Jehaujepoore River, north side, ° ′ ″
η Ceti, E.		34.01.04	32.18.19,3	38.08.20	35	32.08.55	11.19.35 S.	20.49.20	20.51.57
γ Cassiopææ, W.	19th.	41.00.15	38.32.50,5	38.32.30	45	38.33.25,3	59.32.54 N.	20.59.28,7	Chorakootee,
δ Cassiopææ, W.		40.02.18	38.06.02,1	38.05.30	44	38.06.30	59.06.56 N.	21.00.26	° ′ ″
θ Ceti, E.		32.01.04	30.15.49,3	30.15.20	33,3	30.16.08	9.17.47 S.	20.58.21	20.59.09
β Cassiopææ, W.	20th,	44.00.29	31.27.44,7	41.27.30	50	41.28.27,4	62.36.07 N.	21.07.40,4	Raneeka Taulaub, ° ′ ″
δ Ceti, E.		23.00.29	21.42.06	21.42.00	22	21.42.25	0.36.32 S.	21.05.53	21.06.46
α Cassiopææ, W.	21st.	36.01.15	34.05.39,3	34.05.20	38	34.06.08	55.21.23 N.	21.15.15	Kaunse Baunse,
δ Cassiopææ, W.		40.01.16	37.51.05,7	37.51.00	44	37.51.47	59.06.56 N.	21.15.09	
η Ceti, E.		34.02.24	32.31.10,3	02.30.40	36	32.31.31,2	11.19.35 S.	21.11.56,2	° ′ ″
θ Ceti, E.		32.02.06	30.30.45,7	30.30.20	33	30.31.06	9.17.47 S.	21.13.19	21.13.52,3
α Cassiopææ, W.	22d,	36.00.24	33.55.33	33.55.30	38	33.56 09,5	55.21.23 N.	21.25.13,5	Aumnulla, ° ′ ″
η Ceti, E.		34.03.12	32.39.57,3	32.39.40	35,4	32.40.24	11.19.35 S.	21.20.49,0	21.23.01,2
ε Cassiopææ, W.	23d,	43.02.24	40.57.05,4	40.57.00	49,3	40.57.52	62.36.07 N.	21.38.14,3	Daumdurpoor,
γ Andromedis, W.		20.03.25	19.38.10,5	19.37.40	21,8	19.38.17	41.17.22 N.	21.39. 5,0	
α Piscium, E.		21.00.24	19.51.48	19.51.00	21	19.51.45	1.43.03 N.	21.34.48,0	° ′ ″
δ Ceti, E.		23.02.18	22.09.47,2	22.10.00	22,4	22.10.16	0.36.32,0 S.	21.33.44,0	21.36.38
ε Cassiopææ, W.	24th,	43.02.06	40.49.10,8	40.49.00	49	40.19.54,4	62.36.07 N.	21.46.12,6	Soobanreeka River, at Rauje
δ Ceti, E		23.03.09	22.19.54	22.19.30	22	22.20.04	0.36.32 S.	21.43.32,0	Gaut, on the Ballasore side,
ε Cassiopææ, W.	26th,	43,01.30	40.46.10	40.46.00	49	40.46.54	62.36.07 N.	21.49.13,0	° ′ ″
ε Eridani, E.		34.00.06	31.55.08	31.55.08	35	31.55.43	10.13.26,6 S.	21.42.16,4	21.45.18,5
δ Cassiopææ, W.	27th,	39.03.02	37.16.49	37.16.00	48	37.17.13	59.06.56 N.	21.49.43	Jellasore Camp. ° ′ ″
δ Ceti, E.		23.03.10	22.20.20	22.20.00	24	22.20.34	0.36.32 S.	21.44.02	21.46.53
η Ceti, E.	28th,	35.01.27	33.14.40,6	33.14.00	38	33.14.58,3	11.19.35 S.	21.55.23,3	Dantoon Camp.
δ Cassiopææ, W.		39.02.11	37.06.32,5	37.06.00	43	37.06.59,3	59.06.56 N.	21.59.56,7	° ′ ″ 21.57.40

OBSERVATIONS *at large for determining the Latitude of* PLACES.

Phænomenon and Face of the Quadrant.	*Date,*	ARCH OF 96. *Reading.*	ARCH OF 96. *Value.*	*Arc b of 90*	*Equation applied.*	*Zenith Distance Corrected.*	*Declination.*	*Latitude by the observation.*	*Name of the place & its correct Latitude.*
	1784.	D.SD.N.	° ′ ″	° ′ ″	″	° ′ ″	° ′ ″	° ′ ″	
γ Cassiopææ, W.	Dec. 29th,	39.03.21	37.25.10.	37.24.40	42	37.25.37	59.32.55,5 N.	22.07.18	Khutnagur,
η Ceti, E.		35.02.06	33.19.30,6	33,19.10	37	33.19.57,3	11.19.35 S	22.00.22	° ′ ″ 22.03.50
γ Cassiopææ, W.	30th.	39.03.02	37.16.49	37.16.30	42	37.17.22	59 32.55,5 N.	22.15.33,5	Mokurrum-poor,
δ Cassiopææ, W.		39.01.08	36.51.19.7	36.50.40	43	36.51.43	59.06.56 N.	22.15.13	
η Ceti, E.		35.02.27,5	33.28.57,5	33.28.20	37	33.29.16	11.19.35 S.	22.09.41	° ′ ″ 22.12.32,1
γ Persei, W.	31st,	32.00.29	30.12.44,7	30.13.00	33	30.13.25,4	52.37.59 N.	22.24.33,6	Kassai River,
β Persei, W.		18.03.14	17.40.50,4	17.40.30	18	17.40.58,2	40.06.50 N.	22.25.51,8	
δ Ceti, E.		24.01.26	22.55.29,3	22 55.00	24	22.55.39	00.36.32 S.	22.19.07	
12 Eridani, E.		55.02.16	52.08 54,5	52.09 10	73	52.10.15,3	29.51 02 S	22.19.13.3	° ′ ″ 22.22.11,3
δ Cassiopææ, W.	Jan. 4th,	39.00.10	36.38.08,7	36 37.40	42	36.38.36.3	59.06.56 N.	22.28.19,7	Midnapoor Fort,
ε Cassiopææ, W.		42.03.07	40.07.46	40.07.30	48	40.08.26	62.36.07 N.	22 27.41	
δ Ceti, E.		24.02.00	22 58.07,5	22.58.00	24	22.58.48	00.36.32 S.	22.22.16	° ′ ″ 22.25.08,3
ε Cassiopææ, W.	5th,	42.03.05	40.06.53	40.06.00	48	40.07.15	62 36.07 N.	22.28.52	Bunpoor,
δ Ceti, E		24 02.06	23.00.46	23.00.30	24	23.01.02	00.36.32 S.	22.24.30	° ′ ″ 22.26.41
δ Cassiopææ, W.	6th	38.03.12	36.24.57,7	36.25.00	43	36.25.42	59.06.56 N.	22.41.14	Narraindeo-wul,
12 Eridani, E.		55.03.22	52.25.36,4	52.25.30	75	52.26.48,2	29.51.02 S.	22.35.46,2	° ′ ″ 22.38.30
γ Persei, W.	7th,	31.03.09	29.49.53,6	29.49.20.	33	29.50.10	52.37.59 N.	22.47.49	Madapoor,
12 Eridani, E.		56.00.10	52 34.24	55.34.40	74	52.35.46	29.51.02 S	22.44.44	° ′ ″ 22.46.16,5
γ Persei, W.	8th,	31.03.05	29.48.03	29.47.50	33	29 48.32	52.37.59 N	22.49.27	Chunderbund,
12 Eridani, E.		56.00.09	52.34.11	52.34.00	74	52.35.20	29.51.02 S	22.44.18	° ′ ″ 22.46 52,5
γ Persei, W.	10th,	32.00.03	30.01.19	30 01.00	33	30.01.42,5	52.37.39 N.	22.36.16,5	Habra Gaut,
12 Eridani, E.		55.03.14	52.22.05,4	52.22.10	74	52.33.21,7	29.51.02 S	22.32.19,7	° ′ ″ 22.34.18,1

MR. BURROWS published, in the Lady's Diary, a Theorem similar to mine, page 17: he shewed it to me last year: my original Book of Observations convinced him, that his publication could not have been known to me when I wrote the Theorem.

K

III.

A ROYAL GRANT OF LAND, ENGRAVED ON A COPPER PLATE, BEARING DATE TWENTY-THREE YEARS BEFORE CHRIST; AND DISCOVERED AMONG THE RUINS AT MONGUEER.

Tranſlated from the Original SANSCRIT, *by* CHARLES WILKINS, *Eſq. in the Year* 1781.

DEB PAUL DEB *.

PROSPERITY!

HIS wiſhes are accompliſhed. His heart is ſteadfaſt in the cauſe of others. He walks in the paths of virtue. May the achievements of this fortunate Prince cauſe innumerable bleſſings to his People!

By diſplaying the ſtrength of his genius, he hath diſcovered the road to all human acquirements; for being a *Soogot* (1), he is Lord of the Univerſe.

Gopaal, King of the World, poſſeſſed matchleſs good Fortune: he was Lord of two Brides; the Earth and her Wealth. By compariſon of the learned he was likened unto *Preetoo* (2), *Sogor* (3), and others, and it is credited.

When his innumerable army marched, the heavens were ſo filled with the duſt of their feet, that the birds of the air could reſt upon it.

He acted according to what is written in the *Shaſtra* (4), and obliged the different ſects to conform to their proper tenets. He was bleſſed with a ſon, *Dhormo Paal*, when he became independent of his forefathers, who are in heaven.

His elephants moved like walking mountains, and the earth, oppreſſed by their weight and mouldered into duſt, found refuge in the peaceful heavens.

* In this tranſlation the *Sanſcrit* names are written, as they are pronounced in *Bengal*; but, in the following paper, the tranſlator has adopted the more elegant pronunciation of *Váránes* and *Cas'hmìr*.

(1) *Soogót*—ſignifies an Atheiſt, or follower of the tenets of *Soogot*, a Philoſopher, who is ſaid to have flouriſhed at a place called *Keekot* in the province of *Behar*, one thouſand years after the commencement of the *Kolee Joog*, or *Iron Age*; of which this is the 4882d Year. He believed in viſible things only, or ſuch as may be deduced from effects the cauſe of which is known: as from ſmoke the exiſtence of fire. He wrote many books to prove the abſurdity of the religion of the *Brahmons*; and ſome upon Aſtronomy and other ſciences, all which are ſaid to be now in being. He further held that all our actions are attended by their own rewards and puniſhments in this life; and that all animals having an equal right to exiſtence with Man, they ſhould not be killed either for ſport or food.

(2) *Preetoo*—was the ſon of *Beno*, and *Raajaa* of a place called *Beetoor* near *Lucknow*. He flouriſhed in the firſt Age of the World, and is ſaid to have levelled the earth, and, having prepared it for cultivation, obliged the people to live in ſociety.

(3) *Segor*—the name of a Raajaa who lived in the ſecond Age at *Ojoodho*, and is ſaid to have dug the rivers.

(4) *Shaaſtra*—book of divine ordinations: The word is derived from a root ſignifying to command.

He

श्रीदेवपालदेवस्य

[illegible]

He went to extirpate the wicked and plant the good, and happily his ſalvation was effected at the ſame time: for his ſervants viſited *Kedaar* (1), and drank milk according to the law; and they offered up their vows, where the Ganges joins the ocean, and at *Gokornaa* (2), and other places (3).

When he had completed his conqueſts, he releaſed all the rebellious Princes he had made captive, and each returned to his own country laden with preſents, reflected upon this generous deed, and longed to ſee him again; as mortals, remembering a pre-exiſtence, wiſh to return to the realms of light.

This Prince took the hand of the daughter of *Porobol*, Raajaa of many countries, whoſe name was *Ronnaa Debee*; and he became ſettled.

The people, being amazed at her beauty, formed different opinions of her: ſome ſaid it was *Lockee* (4) herſelf in her ſhape; others that the earth had aſſumed her form; many ſaid it was the Raajaa's fame and reputation; and others that a houſehold goddeſs had entered his palace. And her wiſdom and virtue ſet her above all the ladies of the court.

This virtuous and praiſe-worthy Princeſs bore a ſon *Deb Paal Deb*, as the ſhell of the ocean produces the pearl:——

In whoſe heart there is no impurity; of few words, and gentle manners: and who peaceably inherited the kingdom of his father, as *Bodheeſotwo* (5) ſucceeded *Soogot*.

He, who marching through many countries making conqueſts, arrived with his elephants in the foreſts of the mountains of *Beendhyo* (6), where ſeeing again their long-loſt families, they mixed their mutual tears; and who going to ſubdue other Princes, his young horſes meeting their females at *Komboge* (7), they mutually neighed for joy.

He who has opened again the road of liberality, which was firſt marked out in

(1) *Kedaar*—a famous place, ſituated to the north of Hindoſtan, viſited, to this day, on account of its ſuppoſed ſanctity.

(2) *Gokornaa*—a place of religious reſort near *Punjab*.

(3) This and a few other paſſages appear inconſiſtent with the principles of a *Soogot*; to reconcile it therefore, it ſhould be remarked, that, as he was iſſuing his orders to ſubjects of a different perſuaſion, it was natural for him to uſe a language the beſt calculated to ſtrike them with awe, and bind them to a performance of his commands. The *Pundit*, by whoſe aſſiſtance this tranſlation was made, when he was deſired to explain this ſeeming contradiction, aſked whether we did not, in our courts, ſwear a *Muſſulman* upon the *Koran*, and a *Hindoo* by the waters of the *Ganges*, although we ourſelves had not the leaſt faith in either.

(4) *Lockee*—the Hindoo Goddeſs of fortune.

(5) *Bodheeſotwo*—was the ſon of *Soogot*.

(6) *Beendhyo*—name of the mountains on the continent near *Ceylon*.

(7) *Komboge*—now called *Cambay*.

the

the *Kreeto Joog* (1) by *Bolee* (2), in which *Bhaargob* (3) walked in the *Tretaa Joog* (4); which was cleanfed by *Korno* (5) in the *Dwapor Joog* (6), and was again choked up in the *Kolee Joog* (7), after the death of *Sokodweefee* (8).

He who conquered the earth from the fource of the Ganges, as far as the well-known bridge, which was conftructed by the enemy of *Dofaafyo* (9); from the River of *Luckeecool* (10), as far as the ocean of the habitation of *Boroon* (11).

At *Mood-go-gheeree* (12), where is encamped his victorious army; acrofs whofe river a bridge of boats is conftructed for a road, which is miftaken for a chain of mountains; where immenfe herds of elephants, like thick black clouds, fo darken the face of day, that people think it the feafon of the rains; whither the Princes of the North fend fo many troops of horfe, that the duft of their hoofs fpreads darknefs on all fides: whither fo many mighty Chiefs of *Jumboodweep* (13) refort to pay their refpects, that the earth finks beneath the weight of the feet of their attendants. There *Deb Paal Deb* (who, walking in the footfteps of the mighty Lord of the great *Soogots*, the great Commander, *Raajaa* of *Mohaa Raajaas*, *Dhormo Paal Deb*, is himfelf mighty Lord of the great *Soogots*, a great Commander, and *Raajaa* of *Mohaa Raajaas)* iffues his commands.—To all the inhabitants of the town of *Mefeeka*, fituated in *Kreemeelaa*, in the province of *Sree Nogor* (14), which is my own property, and which is not divided by any land belonging to another: to all *Raanok* and *Raaje-pootro*; to the (15) *Omaatyo*, *Mohaa-kaarttaa-kreeteeko*, *Mohaa-Dondo-Nayk*, *Mohaa-Proteehaar*, *Mohaa-Saamont*, *Moohaa-Dow-Saadhon-Saadhoneeko*,

(1) *Kreeto Joog*—the firft Age of the World, fometimes called the *Suttee Joog* or age of purity.
(2) *Bolee*—a famous Giant of the firft Age who is fabled to have conquered earth, heaven, and hell.
(3) *Bhargob*—a *Brahmon*, who having put to death all the princes of the earth, ufurped the government of the whole.
(4) *Treeto Joog*—the fecond Age, or of three parts good.
(5) *Korno*—a famous Hero in the third Age of the World. He was General to *Doorjodhon*, whofe wars with *Joodifteer* are the fubject of the *Mohabharat*, the grand Epick Poem of the Hindoos.
(6) *Dwapor Joog*—the third Age of the world.
(7) *Kolee Joog*—the fourth or prefent Age of the World, of which 4882 years are elapfed.
(8) *Sokodweefee*—an epithet of *Beekromaadeetyo* a famous Raajaa. He fucceeded his brother *Sokaadeetyo*, whom he put to death.
(9) *Dofaafyo*—one of the names of *Raabon*, whofe wars with *Raam* are the fubject of a poem called the *Raamayon*.
(10) *Luckeecool*—now called *Luckeepoor*.
(11) *Boroon*—God of the ocean.
According to this account the Raajaa's *Dominions* extended from the Cow's Mouth to Adam's Bridge in *Ceylon*, faid to have been built by *Raam* in his wars with *Raabon*; from *Luckeepoor* as far as *Goozerat*.
(12) *Mood-go-gheeree*—now called *Mongueer*.
(13) *Jumboodweep*—according to the Hindoo Geography, implies the habitable part of the earth.
(14) *Sree Nogor*—the ancient name of *Patna*.
(15) *Omaatyo*, Prime Minifter. *Mohaa-kaarttaa-kreeteeko*, Chief Inveftigator of all things. *Mo-haa-Dondo Nayk*, Chief officer of Punifhments. *Mohaa-Protee-haar*, Chief Keeper of the Gates. *Mohaa Saamonto*, Generaliffimo. *Mohaa-Dow-Saadhon-Saadhoneeko*, Chief Obviator of Difficulties. *Mohaa-Koomaaraa-Matyo*, Chief inftructor of Children

Saadhoneeko, *Mohaa-Koomaaraa-Matyo*; to the *Promaatree* and *Sorobhongo*; to the *Raajoſtaaneeyo*, *Ooporeeko*, *Daaſaaporaadheeko*, *Chowrod-dhoroneeko*, *Daandeeko*, *Dondopaaſeeko*, *Sowl-keeko*, *Gowlmeeko*, *Kyotropo*, *Praantopaalo*, *Kothtopaalo* and *Kaandaarokyo*, to the *Todaajooktoko* and the *Beeneejooktoko*; to the keeper of the elephants, horſes and camels; to the keeper of the mares, colts, cows, buffaloes, ſheep, and goats; to the *Dootopryſoneeko*, *Gomaa-Gomeeko*, and *Obheetworomaano*; to the *Beeſoypotee*, *Toropotee* and *Toreeko*. To the different tribes *Gowr*, *Maalob*, *Khoſo*, *Hoon*, *Kooleeko*, *Kornaato*, *Laaſaato*, and *Bhoto*; to all others of our ſubjects, who are not here ſpecified; and to the inhabitants of the neighbouring villages, from the *Braahmon* and fathers of large families, to the tribes of *Medo*, *Ondhoroko*, and *Chondaalo*.

Be it known, that I have given the above-mentioned town of *Meſeeka*, whoſe limits include the fields where the cattle graze, above and below the ſurface, with all the lands belonging to it; together with all the *Mango* and *Modhoo* trees; all its waters, and all their banks and verdure; all its rents and tolls, with all fines for crimes, and rewards for catching thieves. In it there ſhall be no moleſtation, no paſſage for troops; nor ſhall any one take from it the ſmalleſt part. I give likewiſe every thing that has been poſſeſſed by the ſervants of the Raajaa: I give the Earth and Sky, as long as the Sun and Moon ſhall laſt: except, however, ſuch lands as have been given to God, and to the *Braahmons*, which they have long poſſeſſed and now enjoy. And that the glory of my father and mother, and my own fame may be increaſed, I have cauſed this *Saaſon* (1) to be engraved, and granted unto the great *Botho Beehkoraato Meeſro*, who has acquired all the wiſdom of books and has ſtudied the *Beads* (2) under *Oſlaayono*; who is deſcended from *Owpomonyobo*; who is the ſon of the learned and immaculate *Botho Boraahoraato*, and whoſe grandfather was *Botho Beeſworaato*, learned in the *Beads*, and expert in performing the *Jog* (3).

Know all the aforeſaid, that as beſtowing is meritorious, ſo taking away deſerves

Children. *Promaatree*, Keeper of the Records. *Sorobhongo*, Patrols. *Raajoſtaaneeyo*, Vice Roy. *Ooporeeko*, Superintendent. *Daaſaa-raadheeko*, Inveſtigator of Crimes. *Chow-rod-dho-roneeko*, Thief Catcher, *Daan-deeko*, Mace Bearer. *Dondo-paſeeko*, Keeper of the Inſtruments of Puniſhment. *Sowl-keeko*, Collector of Cuſtoms. *Gowlmeeko*, Commander of a ſmall party. *Kyotropo*, Superviſor of Cultivation. *Praantopaalo*, Guard of the Suburbs. *Kothtopaalo*, Commander of a Fort. *Kaandaarokyo*, Guard of the Wards of the City. *Todaajooktoko*, Chief Guard of the Wards. *Beeneejooktoko*, Director of Affairs. *Dootopryſoneeko*, Chief of the Spies. *Gomaa-Gomeeko*, Meſſengers. *Obheeworomaano*, Swift Meſſengers. *Beeſoypotee*, Governor of a City. *Toropotee*, Superintendent of the Rivers. *Toreeko*, Chief of the Boats.

(1) *Saaſon*—ſignifies an Edict.

(2) *Beads*—Hindoo Scriptures.

(3) *Jog*—Sacrifice.

puniſhment;

punifhment; wherefore, leave it as I have granted it. Let all his neighbours and thofe who till the land, be obedient to my commands. What you have formerly been accuftomed to perform and pay, do it unto him in all things. Dated in the 33d *Sombot* (1), and 21ft day of the month of *Maargo*.

Thus fpeak the following *Slokes* (2) from the *Dhormo Onoofaafon :*

1. " *Ram* hath required, from time to time, of all the Raajaas that may reign, " that the bridge of their beneficence be the fame, and that they do continually " repair it.

2. " Lands have been granted by *Sogor* and many other Raajaas; and the fame " of their deeds devolves to their fucceffors.

3. " He who difpoffeffes any one of his property, which I myfelf or others " have given, may he, becoming a worm, grow rotten in ordure with his fore- " fathers!

4. " Riches and the life of man are as tranfient as drops of water upon a leaf " of the Lotos. Learning this truth, O man! do not attempt to deprive another " of his reputation."

The Raajaa, for the publick good, hath appointed his virtuous fon, *Raajyo Paal*, to the dignity of *Jowbo Raajaa*. He is in both lines of defcent illuftrious, and hath acquired all the knowledge of his father.

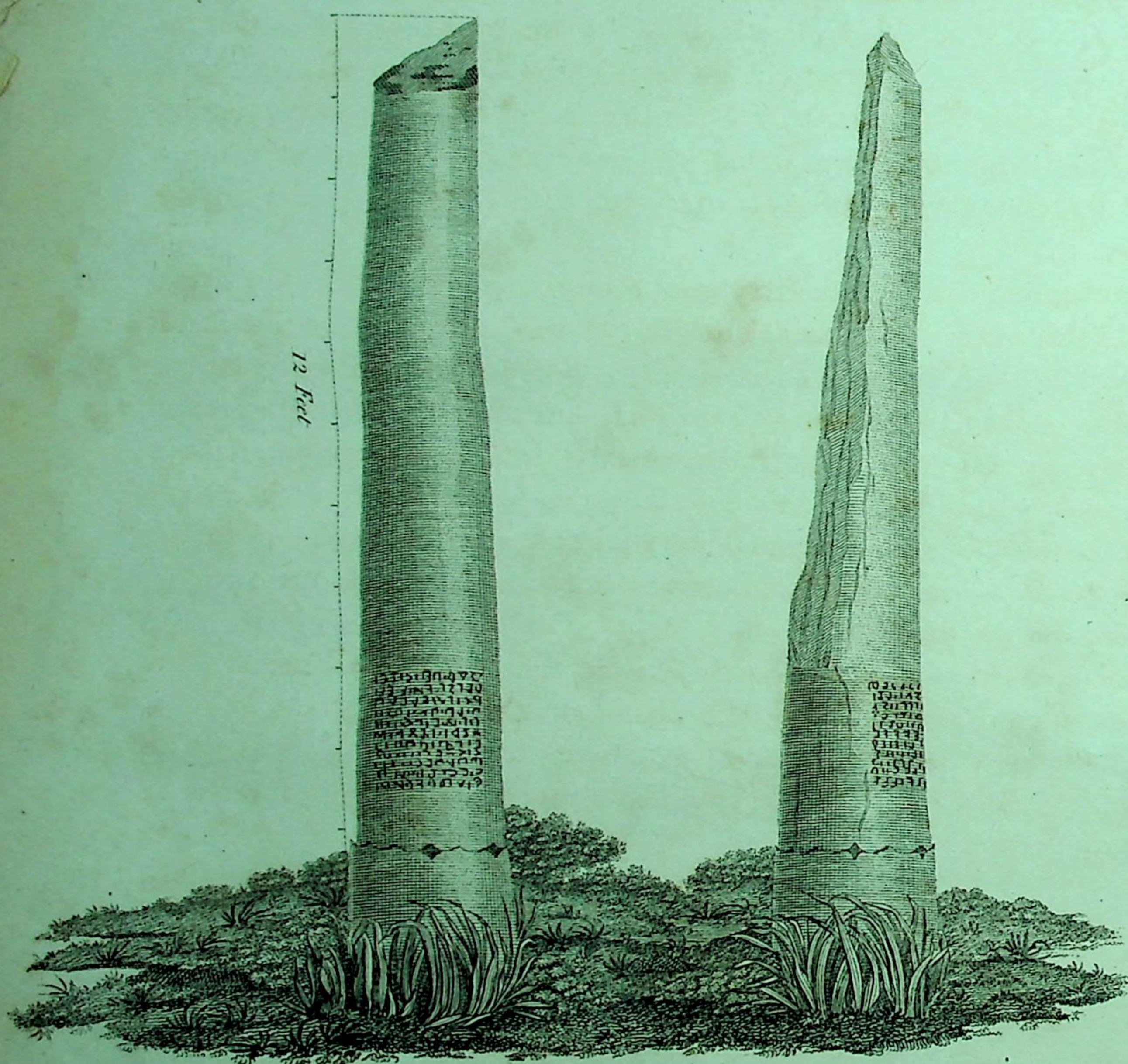
(1) *Sombot*—implies the Æra of Raajaa *Beekromadeetyo*. The *Brahmons*, throughout Hindoftan keep time according to the three following Epochas: The *Kolyobdo* from the flight of *Kreefhno*, or commencement of the *Kolee Joog*, 4882 years. The *Sombot*, from the death of *Beekromadcetyo*, 1837 years. The *Sokaabdo*, from the death of Raajaa *Soko*, 1703.

(2) *Slokes*—ftanzas, commonly, but erroneoufly, written *Afhlogues*.

IV.

Specimen of the Character in the Inscription

श्रीमत्परमेश्वरवल्लभः



IV.

AN INSCRIPTION ON A PILLAR NEAR BUDDAL.

Tranſlated from the SANSCRIT *by* CHARLES WILKINS, *Eſq.*

SOME time in the month of November, in the year 1780, I diſcovered, in the vicinity of the town of *Buddal*, near which the Company have a factory, and which at that time was under my charge, a decapitated monumental column, which at a little diſtance has very much the appearance of the trunk of a coco-nut tree broken off in the middle. It ſtands in a ſwamp overgrown with weeds, near a ſmall temple dedicated to *Hărgowrēē*, whoſe image it contains. Upon my getting cloſe enough to the monument to examine it, I took its dimenſions and made a drawing of it; and ſoon after a plate was engraved, from which the accompanying is an impreſſion.

It is formed of a ſingle ſtone of a dirty grey complexion; and it has loſt by accident a conſiderable part of its original height. I was told upon the ſpot that it had, in the courſe of time, ſunk conſiderably in the ground; but upon my digging about the foundation I found this was not the caſe. At a few feet above the ground is an inſcription engraved in the ſtone, from which I took two reverſed impreſſions with printer's ink. I have lately been ſo fortunate as to decypher the character; and I have the honour to lay before the Society a tranſcript of the original in the modern writing, and a tranſlation; and at the ſame time to exhibit the two impreſſions I took from the ſtone itſelf.

The original character of this inſcription is very different from the modern form; but it ſo much reſembles that on the plate found by Col. WATSON at *Mongueer*, that I am induced to conclude it to be a work of the ſame period. The language is *Sămſkrēēt*, and the whole is compriſed in twenty-eight metrical verſes of various meaſures.

CHARLES WILKINS.

14th July, 1785.

I. *VEERA*

PROSPERITY!

I.

VEERĂ DEV was of the *Sāndēēlyă race* (1); from him was defcended *Pānchāl*; of whofe generation, and of whom, was *Gărgă* born.

II.

He, another *Săkră* (2), was ruler but of one quarter, and had no authority in other regions. He, too, was defeated by *Dityă* (3) chiefs; but being a virtuous prince, he became fupreme over every country without referve; and his conduct was fuch, that he laughed *Vrēēhăſpatēē* (4) to fcorn.

III.

Eechā (5) was his wife; and, like love, fhe was the miftrefs of his heart. She was admired for the native purity of her mind, and her beauty was like the light of the moon.

IV.

In his countenance, which was like the flower of the waters (6), were to be traced the lines of four fciences (7). The three worlds were held in fubjection by his hereditary high rank.

From thefe two was defcended a *Brāhmăn* like *Kămălăyōnēē* (8), and he took unto himfelf the name of *Srēē Dărbhă-pānēē*:

V.

Whofe country, (extending to *Rēvă-Jănăk* (9); to the father of *Gowrēē* (10) whofe piles of rocks reek with the juice exuding from the heads of intoxicated elephants, and whofe fnow-white mountains are brightened by the fun's rays; to the two oceans:—to that whence *Arōōn* (11) rifeth from its bed, and to that wherein

(1) A tribe of *Brāhmăns* ftill extant.
(2) *Eendră*, the God of the Heavens, who is fuppofed to be the Guardian of the Eaft.
(3) Evil fpirits. *Eendră* is faid to have loft his kingdom, for a while, to the *Aſōōrs* or evil fpirits.
(4) The tutor of the good fpirits, and the planet Jupiter.
(5) Love, defire.
(6) The Lotus.
(7) Arms, Mufick, Mechanicks, Phyficks.
(8) *Brăhmā*.
(9) Perhaps the *Narbădda*.
(10) The fnowy mountains that part India from Tartary. *Gowrēē* one of the names of the *Pārvătēē*, the confort of *Sēēv*.
(11) The Charioteer of the Sun.—The Aurora of the Hindoos.

the

the ſun ſinketh in the weſt), the Prince *Srēē Dēv Pāl* (1), by his policy, rendered tributary;

VI.

At whoſe gates (although the proſpect, hidden by the duſt ariſing from the multitude of marching force, was rendered clear from the earth being watered by conſtant and abundant ſtreams flowing from the heads of luſtful elephants of various breeds), ſtood, ſcarce viſible, amongſt the vaſt concourſe of nobles flocking to his ſtandard from every quarter, *Srēē Dēv Pāl* in expectation of his ſubmiſſion.

VII.

Whoſe throne, that Prince (who was the image of *Eēndră*, and the duſt of whoſe feet was impreſſed with the diadems of ſundry potentates) himſelf aſcended with a flaſh of glory, although he had formerly been wont to offer him large ſums of *Pēētăs* (2) bright as the lunar rays.

VIII.

To him was born, of the Princeſs *Sărkără*, the Brāhmăn *Sōmēſwăr*, who was like *Sōm* (3) the offspring of *Ătrēē*, and a favourite of the moſt high.

IX.

He adopted the manners of *Dhănănjay* (4), and did not exult over the ignorant and ill-favoured. He ſpent his riches amongſt the needy. He neither vainly accepted adulation, nor uttered honey words. His attendants were attached by his bounty; and becauſe of his vaſt talents, which the whole univerſe could not equal, he was the wonder of all good men.

X.

Anxious for a home and an aſylum, he took the hand of *Rănnā* (5), a princeſs of his own likeneſs, according to the law, even as *Sēēv* the hand of *Sēēva* (6)—even as *Hărēē* (7) the hand of *Lăkſhmēē*.

XI.

From this pair proceeded into life, burſting forth like *Gōōhă* (8) with a counte-

(1) If this be the prince mentioned in the copper plate found by Col. WATSON, he reigned at Mongueer above 1800 years ago.
(2) A ſquare coin.
(3) The Moon.
(4) One of the ſons of Pandoo, commonly called *Arjoon*.
(5) A Princeſs of this name is alſo mentioned in Colonel WATSON's plate.
(6) *Sēēvā* is the feminine of *Sēēv*.
(7) *Harēē*, a name of *Vēēſhnōō*.
(8) *Gōōhă*, a name of *Kărtēēk*.

 nance

nance of a golden hue, the fortunate *Kēdārā Mēēsră*, whose actions rendered him the favourite of heaven.—The lofty diadem, which he had attained, shone with faultless splendour, kissing the vast circumference of the earth. His extensive power was hard to be limited; and he was renowned for boundless knowledge raised from his own internal source.

XII.

The ocean of the four sciences, which had been at a single draught drunk up, he brought forth again, and laughed at the power of *Agăstyă* (1).

XIII.

Trusting to his wisdom, the king of *Gowr* (2) for a long time enjoyed the country of the eradicated race of *Ŏŏtkal* (3), of the *Hoons* (4) of humbled pride, of the kings of *Drăvēēr* (5) and *Gŏŏrjăr* (6), whose glory was reduced, and the universal sea-girt throne.

XIV.

He considered his own acquired wealth the property of the needy, and his mind made no distinction between the friend and the foe. He was both afraid and ashamed of those offences, which condemn the soul to sink again into the ocean of mortal birth; and he despised the pleasures of this life, because he delighted in a supreme abode.

XV.

To him, emblem of *Vrēēhăspătēē* (7), and to his religious rites, the prince *Srēē Sŏŏră Pāl* (who was a second *Eendră*, and whose soldiers were fond of wounds) went repeatedly; and that long and happy companion of the world, which is girt with several oceans as with a belt, was wont, with a soul purified at the fountain of faith, and his head humbly bowed down, to bear pure water before him.

XVI.

Vănwā, of celestial birth, was his consort, with whom neither the fickle *Lăkshmēē* nor *Sătēē* (8) constant to her lord, were to be compared.

(1) Who is said to have drunk up the ocean.
(2) The kingdom of *Gowr* anciently included all the countries which now form the kingdom of Bengal on this side the *Brăhmăpŏŏtră*, except *Mongueer*.
(3) Orixa.
(4) Huns.
(5) A country to the south of the Carnatick.
(6) Goozerat.
(7) The preceptor of the good spirits, and the planet *Jupiter*.
(8) The consort of *Sēēv*.

XVII.

XVII.

She, like another *Dēvăkēē* (1), bore unto him a ſon of high renown, who reſembled the adopted of *Yăsōdhā* (2) and huſband of *Lăkſhmēē* (3).

XVIII.

This youth, by name *Srēē Gōōrăvă Mēēſră*, was acquainted with all the conſtellations. He reſembled *Rām*, the ſon of *Jămădăgnēē* (4). He was another *Rām*.

XIX.

His abilities were ſo great, that he was ſolicitous to diſcover the eſſence of things, wherefore he was greatly reſpected by the Prince *Srēē Nārāyăn Pāl.* What other honour was neceſſary?

XX.

His policy (who was of no mean capacity, and of a reputation not to be conceived), following the ſenſe of the *Vēds*, was of boundleſs ſplendor, and, as it were, a deſcent of *Dhărmă*, the Genius of Juſtice. It was regulated by the example of thoſe who truſt in the power of ſpeech over things future, who ſtand upon the connexion of family, who are in the exerciſe of paying due praiſe to the virtues of great men, and who believe in the purity of *Aſtrology*.

XXI.

In him was united a lovely pair, *Lăkſhmēē* and *Sărăſwătēē*, the diſpoſer of fortune, and the Goddeſs of Science, who ſeemed to have forſaken their natural enmity, and to ſtand together pointing at friendſhip.

XXII.

He laughed to ſcorn, him, who, in the aſſemblies of the learned, was intoxicated with the love of argument, and confounded him with profound and elegant diſcourſes framed according to the doctrine of the *Săſtrăs*; and he ſpared not the man, who, becauſe of his boundleſs power and riches, was overwhelmed with the pride of victory over his enemy in the field.

XXIII.

He had a womb, but it obſtinately bore him no fruit. One like him can have

(1) The real mother of *Krēēſhnă*.
(2) The foſter-mother of *Krēēſhnă*.
(3) *Rōōkmēēnēē* the conſort of *Krēēſhnă*. She is here called *Lăkſhmēē*, in compliance with the idea of her being a deſcent of that goddeſs.
(4) This is neither the conqueror of *Cylon*, nor the brother of *Krēēſhnă*.

no

no great relifh for the enjoyments of life! He never was bleffed with that giver of delight, by obtaining which a man goeth unto another almoner (1).

XXIV.

He, who was, as it were, another *Vālmēēkēē* (2) born in this dark age of impiety, amongft a dreadful and a cruel race of mortals, was a devout man who difplayed the learning of the *Vēds* in books of moral tales.

XXV.

His profound and pleafing language, like *Găngā*, flowing in a triple courfe (3) and conftant ftream, purifieth and delighteth.

XXVI.

He, to whom, and to thofe of whofe generation, men were wont to refort as it were to *Brăhmā*, waited fo long in expectation of being a father, that, at length, he himfelf arrived at the ftate of a child.

XXVII.

By him was recorded here upon this lafting column, the fuperior beauty of whofe fhaft catcheth the eye of the beholder, whofe afpiring height is as boundlefs as his own ideas, which is, as it were, a ftake planted in the breaft of *Kălēē* (4), and on whofe top fits *Tārkfhyă* (5), the foe of ferpents and favourite bird of *Haree*, the line of his own defcent.

XXVIII.

Gărōōr, like his fame, having wandered to the extremity of the world, and defcended even unto its foundation, was exalted here with a ferpent in his mouth.

This work was executed by the artift *Bēēndōō Bhădră*.

(1) He had no iffue to perform the *Srādh* for the releafe of his foul from the bonds of fin. By *another almoner* is meant the deity.
(2) The firft poet of the Hindoos, and fuppofed author of the *Rāmāyăn*.
(3) He is fuppofed to have written in three languages.
(4) Time.
(5) Otherwife called *Gărōōr*.

REMARKS

REMARKS ON THE TWO PRECEDING PAPERS.

By the PRESIDENT.

NO man has greater reſpect than myſelf for the talents of Mr. WILKINS, who, by decyphering and explaining the old *Sanſcrit* inſcriptions lately found in theſe provinces, has performed more than any other *European* had learning enough to accompliſh, or than any *Aſiatick* had induſtry enough even to undertake: but, ſome doubts having ariſen in my mind concerning a few paſſages in the two preceding tranſlations, I venture to propoſe them in the form of notes with entire deference to his judgement.

P. 62. *l.* 10. *this fortunate prince)*—Is not the firſt couplet in honour of BUDDHA, one of whoſe names, in the *Amarcóſh*, is SUGATA? A *follower* of his tenets would have been denominated a *Saugat*, in the derivative form. We muſt obſerve, that the *Bauddhs*, or *Saugats*, are called *Atheiſts* by the *Bráhmans*, whom they oppoſed; but it is mere invective; and this very grant fully diſproves the calumny by admitting a future ſtate of rewards and puniſhments. SUGAT was a reformer; and every reformer muſt expect to be calumniated.

P. 62. *l.* 17. *When his innumerable army)*—The third ſtanza in the original is here omitted, either by an overſight, or becauſe the ſame image of *weeping elephants* occurs afterwards, and might have been thought ſuperfluous in this place: neverthelefs, I inſert a literal tranſlation of it.

"By whom, having conquered the earth as far as the ocean, it *was* left, as being unprofitably ſeized; ſo "*he declared: and his* elephants weeping ſaw again in the foreſts their kindred whoſe-eyes-*were*-full-of-tears."

P. 63. *l.* 9. *of many countries)*—The *Pandits* inſiſt, that *Ráſhtracúta* in the original is the name of a particular country.

P. 66. *l.* 4. *dated in the* 33*d Sombot)*—That is *year*; for *Samvat* is only an abbreviation of *Samvatſara.* This date, therefore, might only mean the thirty-third year *of the King's reign*; but, ſince VICRAMA'DITYA was ſurnamed *the foe of* SACA, and is praiſed by that name in a preceding ſtanza, we may ſafely infer, that the grant was dated thirty-three years after the death of that illuſtrious Emperor, whom the king of *Gaur*, though a ſovereign prince, acknowledged as lord paramount of *India*.

P. 68. Verſe II. a virtuous prince) Many ſtanzas in this inſcription prove, that the *Sándilya* family were not *princes*, but that ſome of them were *prime* miniſters to the kings of *Gaur*, or *Bengal*, according to this comparative genealogy.

Kings.	Miniſters *.
GO'PA'LA.	PA'NCHA'LA.
DHERMAPA'LA.	GARGA.
DE'VAPA'LA. B. C. 23.	* DERBHAPA'NI.
RA'JYAPA'LA.	SOME'SWARA.
S'U'RAPA'LA.	* CE'DA'RAMIS'RA.
NA'RA'YANAPA'LA. A. C. 67.	* GURAVAMIS'RA.

So that, reckoning thirty years to a generation, we may date the pillar of GURAVAMIS'RA in the ſixty-ſeventh year *after* CHRIST. A *Pandit*, named RA'DHA'CA'NTA, with whom I read the original, appeared ſtruck with my remark on the two families, and adopted it without heſitation; but, if it be juſt, the ſecond ſtanza muſt be differently interpreted. I ſuſpect *dharma*, the genius of *juſtice* or *virtue*, to be the true reading inſtead of *dharmya*, or *virtuous*, and have no doubt, that *purò* muſt be ſubſtituted for *parò*: the ſenſe will then be, that INDRA *was ruler in the Eaſt only*, and, *though valiant, had been defeated even there by the Daityas* or *Titans*, *but that* DHARMA *was made ſovereign over him in all quarters*.

P. 68, Ver. V. Whoſe country) The original is:

à révájanacánmatangajamadaſtimyachch'hilàſanghatéh,
à gaurípiturísware*ndra*ciranaihpuſhyatſitimnógiréh,
mártan"dáſtamayódayárun'ajalád á vár'irásidwayàt,
nítyà yasya bhuwan chacára caradán srí dévapálò nripah.

The

The father of *Révà* is the *Mahéndra* mountain in the ſouth, in which that river has its ſource; as the father of GAURI' is the *Himálaya* in the north; where IS'WARA, who has a *moon* on his forehead, is believed often to reſide: hence RA'DHA'CA'NTA propoſed a conjectural emendation, which would have done honour to SCALIGER or BENTLEY. Inſtead of *indra*, which is a name of the *ſun*, he reads *indu*, or the *moon*, by changing only a ſmall ſtraight line into a ſmall curve; and then the ſtanza will run thus:

BY whoſe policy the great Prince DE'VAPA'LA made the earth tributary, from the father of *Révà*, whoſe-piles-of-rocks-are-moiſt-with-juice-from-the-heads-of-laſcivious-elephants, to the-father-of-GAURI, whoſe-white-mountains-are-brightened-with-beams-from-the-moon-of-ISWARA; *and* as far as the-two-oceans whoſe-waters-are-red-with-the-riſing-and-with-the-ſetting-Sun.

The words connected by hyphens are compounds in *Sanſcrit*.

P. 69. Verſe VI. ſubmiſſion) I underſtand *avaſara* in this place to mean the *leiſure* of the Miniſter from publick affairs, for which even the King waited at the head of his army.

P. 69. Verſe VII. ſums of *Pēētās*) The common ſenſe of *pít'ha* is a *chair*, *ſeat*, or *throne*; and in this ſenſe it occurs in the thirteenth verſe. *Ud'upachch'habipít'ham*, or *with-a-ſeat-bright-as-the-moon*, appears to be the compound epithet of *áſanam*, or *chair of ſtate*, which though the King had often given to his Miniſter, yet, abaſhed by his wiſdom, and apprehenſive of his popularity, he had himſelf aſcended his throne *with fear*.

P. 69. Verſe X. The tenth ſtanza is extremely difficult, as it contains many words with two meanings, applied in one ſenſe to the Miniſter CE'DA'RA MIS'RA, but, in another, to CA'RTICE'YA, the *Indian* MARS: thus, in the firſt hemiſtich, *s'ic'hin* means *fire* or a *peacock*; *s'ic'há*, a *bright flame*, or a *creſt*, and *s'acti*, either *power* or a *ſpear*. As the verſe is differently underſtood, it may be a deſcription of the *Bráhmen* or of the Deity.

P. 70. Verſe XII. The *Bráhmans* of this province inſiſt, that by the four *Vidyà's*, or branches of *knowledge* are meant the four *Véda's*, not the *Upavéda's*, or *Medicine*, *Archery*, *Muſick*, and *Mechanicks*; and they cite two diſtichs from the *Agnipurána*, in which *eighteen Vidyà's* are enumerated, and, among them, the *four Véda's*; *three* only of which are mentioned in the *Amarcòſh* and in ſeveral older books. In this verſe alſo RA'DHA'CA'NT has diſplayed his critical ſagacity: inſtead of *nála* he reads *bála*, and, if his conjecture be right, we muſt add "*even* when he was a *boy*."

P. 70. Verſe XVI. conſtant to her lord) RA'DHA'CA'NT reads *anapatyayà*, or *childleſs*, for *anupatyayà*; SATI' having borne *no children*, till ſhe became regenerate in the perſon of PA'RVATI'.

P. 71. Verſe XXIII. it obſtinately bore him no fruit) The original ſtanza is uncommonly obſure: it begins with the words *yónirbabhúva*, the two firſt ſyllables of which certainly mean *a womb*; but ſeveral *Pandits*, who were conſulted apart, are of opinion, that *yò* is the relative, of which ſome word in the maſculine gender, ſignifying *ſpeech*, is the antecedent, though not expreſſed: they explain the whole ſtanza thus—"*That ſpeech*, which came forth (*nirbabhúva*) inconſiderately, of which *there was* no fruit, *he* "*was a man* who ſpoke nothing of that kind for his own gratification: *he was a man* alſo, by whom no "preſent-of-playthings was ever *given*, which the ſuppliant having received goes to another *more bountiful* "giver." If the relative had been *yan* in the *neuter* gender, I ſhould have acquieſced in the tranſlation offered by the *Pandits*; but the ſuppreſſion of ſo material a word as *ſpeech*, which, indeed, is commonly *feminine* in *Sanſcrit*, appears unwarrantably harſh according to *European* ideas of conſtruction.

P. 72. Verſe XXVI. If the preceding interpretation be juſt, the object of the pillar was to perpetuate the names of GURAVA MIS'RA and his anceſtors; and this verſe muſt imply, that *he expected to receive from his own ſons the pious offices, which he had performed to his forefathers.*

SOME

V.

SOME ACCOUNT OF THE SCULPTURES AND RUINS AT MAVALIPURAM, A PLACE A FEW MILES NORTH OF SADRAS, AND KNOWN TO SEAMEN BY THE NAME OF THE SEVEN PAGODAS.

By WILLIAM CHAMBERS, ESQ.

AS amidſt inquiries after the hiſtories and antiquities of *Aſia* at large, thoſe of that diviſion of it in which this Society reſides, may ſeem on many accounts to lay claim to a particular ſhare of its attention, a few hints put down from recollection, concerning ſome monuments of *Hindoo* antiquity, which, though ſituated in the neighbourhood of *European* ſettlements on the *Choromandel* coaſt, have hitherto been little obſerved, may it is conceived be acceptable, at leaſt as they may poſſibly give riſe hereafter to more accurate obſervations, and more complete diſcoveries on the ſame ſubject. The writer of this account went firſt to view them in the year 1772, and curioſity led him thither again in 1776; but as he neither meaſured the diſtances nor ſize of the objects, nor committed to writing at the time the obſervations he made on them, he hopes to be excuſed if after the lapſe of ſo many years, his recollection ſhould fail him in ſome reſpects, and his account fall far ſhort of that preciſion and exactneſs, which might have been expected, had there then exiſted in *India*, ſo powerful an incentive to diligent enquiry and accurate communication, as the eſtabliſhment of this Society muſt now prove.

The Monuments he means to deſcribe, appear to be the remains of ſome great city, that has been ruined many centuries ago; they are ſituated cloſe to the ſea, between *Covelong* and *Sadras*, ſomewhat remote from the high road, that leads to the different *European* Settlements. And when he viſited them in 1776, there was ſtill a native village adjoining to them, which retained the antient name, and in which a number of *Bramins* reſided that ſeemed perfectly well acquainted with the ſubjects of moſt of the Sculptures to be ſeen there.

The rock or rather hill of ſtone, on which great part of theſe works are executed, is one of the principal marks for mariners as they approach the coaſt, and to them the place is known by the name of the *Seven Pagodas*, poſſibly becauſe the

the ſummits of the rock have preſented them with that idea as they paſſed : but it muſt be confeſſed, that no aſpect which the hill aſſumes as viewed on the ſhore, ſeems at all to authorize this notion ; and there are circumſtances, which will be mentioned in the ſequel, that would lead one to ſuſpect, that this name has ariſen from ſome ſuch number of Pagodas that formerly ſtood here, and in time have been buried in the waves. But, be that as it may, the appellation by which the natives diſtinguiſh it, is of a quite different origin ; in their language, which is the *Tamulic* (improperly termed *Malabar*) the place is called *Mâvalipuram*, which in *Shanſcrit*, and the languages of the more northern *Hindoos*, would be *Mahâbalipûr*, or the *City of the great Bali*. For the *Tamulians* (or *Malabars*) having no *h* in their alphabet, are under a neceſſity of ſhortening the *Shanſcrit* word Mahâ, *great*, and write it *mâ**. They are obliged alſo for a ſimilar reaſon to ſubſtitute a *v* for a *b*, in words of *Shanſcrit*, or other foreign original that begin with that letter, and the ſyllable *am* at the end is merely a termination, which, like *um* in *Latin*, is generally annexed to neuter ſubſtantives†. To this etymology of the name of this place it may be proper to add, that *Bălĭ* is the name of an hero very famous in *Hindoo* romance, and that the river *Mávaligonga*, which waters the eaſtern ſide of *Ceylone*, where the *Tamulic* language alſo prevails, has probably taken its name from him, as according to that orthography, it apparently ſignifies the *Ganges* of the great *Bălĭ*.

The rock or hill of ſtone above mentioned, is that which firſt engroſſes the attention on approaching the place ; for as it riſes abruptly out of a level plain of great extent, conſiſts chiefly of one ſingle ſtone, and is ſituated very near to the ſea beach, it is ſuch a kind of object as an inquiſitive traveller would naturally turn aſide to examine. Its ſhape is alſo ſingular and romantic, and, from a diſtant view, has an appearance like ſome antique and lofty edifice. On coming near to the foot of the rock from the north, works of imagery ‡ and ſculpture croud ſo thick upon the eye, as might ſeem to favour the idea of a petrified town, like thoſe that have been fabled in different parts of the world by too credulous travellers §. Proceeding on

* They do indeed admit a ſubſtitute, but the abbreviation is moſt uſed.

† This explains alſo, why the *Shanſcrit* word Vêd, by which the *Hindoos* denominate the books of the law of their religion, is written by the *Tamulians* Vedam, which is according to the true orthography of their language, and no miſtake of *European* travellers as ſome have ſuppoſed ; while the ſame word is called Bêd by the *Bengalies*, who have in effect no *V* in their alphabet.—See Dow, Vol. I. Diſſert. P. 41.

‡ Among theſe, one object, though a mean one, attracts the attention on account of the groteſque and ridiculous nature of the deſign ; it conſiſts of two monkies cut of one ſtone, one of them in a ſtooping poſture, while the other is taking the inſects out of his head.

§ See Shaw's Travels, P. 155, et ſeq.

by

by the foot of the hill on the ſide facing the ſea, there is a pagoda riſing out of the ground of one ſolid ſtone, about ſixteen or eighteen feet high, which ſeems to have been cut upon the ſpot out of a detached rock, that has been found of a proper ſize for that purpoſe. The top is arched, and the ſtile of architecture according to which it is formed, different from any now uſed in thoſe parts. A little further on, there appears upon an huge ſurface of ſtone, that juts out a little from the ſide of the hill, a numerous group of human figures in baſs relief, conſiderably larger than life, repreſenting the moſt remarkable perſons, whoſe actions are celebrated in the *Mahabhârit*, each of them in an attitude, or with weapons, or other inſignia, expreſſive of his character, or of ſome one of his moſt famous exploits. All theſe figures are, doubtleſs, much leſs diſtinct than they were at firſt; for upon comparing theſe and the reſt of the ſculptures that are expoſed to the ſea air, with others at the ſame place, whoſe ſituation has afforded them protection from that element, the difference is ſtriking, the former being every where much defaced, while the others are freſh as recently finiſhed. This defacement is no where more obſervable, than in the piece of ſculpture which occurs next in the order of deſcription. This is an excavation in another part of the eaſt ſide of the great rock, which appears to have been made on the ſame plan, and for the ſame purpoſe, that Chowltries are uſually built in that country, that is to ſay, for the accommodation of travellers. The rock is hollowed out to the ſize of a ſpacious room, and two or three rows of pillars are left, as a ſeeming ſupport to the mountainous maſs of ſtone which forms the roof. Of what pattern theſe pillars have originally been, it is not eaſy now to conjecture, for the air of the ſea has greatly corroded them, as well as all the other parts of the cave. And this circumſtance renders it difficult to diſcover at firſt ſight, that there is a ſcene of ſculpture on the ſide fronting the entrance. The natives, however, point it out, and the ſubject of it is manifeſtly that of *Kriſhen* attending the herds of *Nund Ghoſe*, the *Admetus* of the *Hindoos*, from which circumſtance, *Kriſhen* is alſo called *Gopaul*, or the cowherd, as *Apollo* was entitled *Nomius*.

The objects that ſeem next to claim regard, are thoſe upon the hill itſelf, the aſcent of which, on the north, is, from its natural ſhape, gradual and eaſy at firſt, and is in other parts rendered more ſo, by very excellent ſteps cut out in ſeveral places, where the communication would be difficult or impracticable without them. A winding ſtair of this ſort leads to a kind of temple cut out of the ſolid rock, with ſome figures of idols in high relief upon its walls, very well finiſhed and perfectly freſh, as it faces the weſt, and is therefore ſheltered from the ſea air. From this temple

again there are flights of ſteps that ſeem to have led to ſome edifice, formerly ſtanding upon the hill, nor does it ſeem abſurd to ſuppoſe, that this may have been a palace, to which this temple, as a place of worſhip, may have appertained. For beſides the ſmall detached ranges of ſtairs that are here and there cut in the rock, and ſeem as if they had once led to different parts of one great building, there appear in many places, ſmall water channels cut alſo in the rock, as if for drains to an houſe, and the whole top of the hill is ſtrewed with ſmall round pieces of brick, which may be ſuppoſed from their appearance to have been worn down to their preſent form, during the lapſe of many ages. On aſcending the hill by its ſlope on the north, a very ſingular piece of ſculpture preſents itſelf to view. On a plain ſurface of the rock, which may once have ſerved as the floor of ſome apartment, there is a platform of ſtone, about eight or nine feet long, by three or four wide, in a ſituation rather elevated, with two or three ſteps leading up to it, perfectly reſembling a couch or bed, and a lion very well executed at the upper end of it by way of pillow, the whole of one piece, being part of the hill itſelf. This the *Bramins*, inhabitants of the place, call *the bed of Dermarájah* or *Judiſhter*, the eldeſt of the five brothers whoſe fortunes and exploits are the leading ſubject in the *Mahabhárit*. And at a conſiderable diſtance from this, at ſuch a diſtance indeed as the apartment of the women might be ſuppoſed to be from that of the men, is a bath excavated alſo from the ſolid rock, with ſteps in the inſide, which the *Bramins* call the bath of *Dropedy*, the wife of *Judiſhter* and his brothers. How much credit is due to this tradition, and whether this ſtone couch may not have been antiently uſed as a kind of throne rather than a bed, is matter for future inquiry. A circumſtance, however, which may ſeem to favour this idea is, that a throne in the *Shanſcrit* and other *Hindoo* languages is called *Singháſen*, which is compoſed of the words *Sing* a lion, and *áſen* a ſeat.

Theſe are all that appear on that part of the upper ſurface of the hill, the aſcent to which is on the north, but on deſcending from thence you are led round the hill to the oppoſite ſide, in which there are ſteps cut from the bottom to a place near the ſummit, where is an excavation that ſeems to have been intended for a place of worſhip, and contains various ſculptures of *Hindoo* Deities. The moſt remarkable of theſe, is a gigantic figure of *Viſhnoo*, aſleep on a kind of bed, with a huge ſnake wound about in many coils by way of pillow for his head, and theſe figures, according to the manner of this place, are all of one piece hewn from the body of the rock.

But though theſe works may be deemed ſtupendous, they are ſurpaſſed by others that

that are to be ſeen at the diſtance of about a mile, or a mile and an half to the ſouthward of the hill. They conſiſt of two Pagodas of about thirty feet long by twenty feet wide, and about as many in heighth, cut out of the ſolid rock, and each conſiſting originally of one ſingle ſtone. Near theſe alſo ſtand an elephant full as big as life, and a lion much larger than the natural ſize, but very well executed, each hewn alſo out of one ſtone. None of the pieces that have fallen off in cutting theſe extraordinary ſculptures, are now to be found near or any where in the neighbourhood of them, ſo that there is no means of aſcertaining the degree of labour and time that has been ſpent upon them, nor the ſize of the rock or rocks from which they have been hewn, a circumſtance which renders their appearance the more ſtriking and ſingular. And though their ſituation is very near the ſea-beach, they have not ſuffered at all by the corroſive air of that element, which has provided them with a defence againſt itſelf, by throwing up before them a high bank that completely ſhelters them. There is alſo great ſymmetry in their form, though that of the Pagodas is different from the ſtile of architecture, according to which idol temples are now built in that country. The latter reſembles the *Egyptian*, for the towers are always pyramidical, and the gates and roofs flat and without arches, but theſe ſculptures approach nearer to the *Gothick* taſte, being ſurmounted by arched roofs or domes that are not ſemicircular but compoſed of two ſegments of circles meeting in a point at top. It is alſo obſervable that the lion in this group of ſculptures, as well as that upon the ſtone couch above mentioned, are perfectly juſt repreſentations of the true lion, and the natives there give them the name, which is always underſtood to mean a lion in the *Hindoo* language, to wit, *Sing*; but the figure which they have made to repreſent that animal in their idol temples for centuries paſt, though it bears the ſame appellation, is a diſtorted monſter totally unlike the original; inſomuch that it has from hence been ſuppoſed, that the lion was not antiently known in this country, and that *Sing* was a name given to a monſter, that exiſted only in *Hindoo* romance. But it is plain that that animal was well known to the authors of theſe works, who in manners as well as arts ſeem to have differed much from the modern *Hindoos*.

There are two circumſtances attending theſe monuments, which cannot but excite great curioſity, and on which future inquiries may poſſibly throw ſome light. One is, that on one of the Pagodas laſt mentioned, there is an inſcription of a ſingle line, in a character at preſent unknown to the *Hindoos*. It reſembles neither the *Deyva-nâgre*, nor any of the various characters connected with or derived from it, which

which have come to the writer's knowledge from any part of *Hindoſtan*. Nor did it, at the time he viewed it, appear to correſpond with any character, *Aſiatick* or *European*, that is commonly known. He had not then, however, ſeen the alphabet of the *Balic*, the learned language of the *Siameſe*, a ſight of which has ſince raiſed in his mind a ſuſpicion, that there is a near affinity between them, if the character be not identically the ſame. But as theſe conjectures, after ſuch a lapſe of time, are ſomewhat vague, and the ſubject of them is perhaps yet within the reach of our reſearches, it is to be hoped that ſome method may be fallen upon of procuring an exact copy of this inſcription.

The other circumſtance is, that though the outward form of the Pagodas is complete, the ultimate deſign of them has manifeſtly not been accompliſhed, but ſeems to have been defeated by ſome extraordinary convulſion of nature. For the weſtern ſide of the moſt northerly one, is excavated to the depth of four or five feet, and a row of pillars left on the outſide to ſupport the roof, but here the work has been ſtopped, and an uniform rent of about four inches breadth has been made throughout the ſolid rock, and appears to extend to its foundations, which are probably at a prodigious depth below the ſurface of the ground. That this rent has happened ſince the work begun, or while it was carrying on, cannot be doubted, for the marks of the maſon's tools are perfectly viſible in the excavated part on both ſides of the rent, in ſuch a manner as to ſhow plainly, that they have been divided by it. Nor is it reaſonable to ſuppoſe, that ſuch a work would ever have been deſigned or begun, upon a rock that had previouſly been rent in two.

Nothing leſs than an earthquake, and that a violent one, could apparently have produced ſuch a fiſſure in the ſolid rock; and that this has been the caſe in point of fact, may be gathered from other circumſtances, which it is neceſſary to mention in an account of this curious place.

The great rock above deſcribed is at ſome ſmall diſtance from the ſea, perhaps fifty or an hundred yards, and in that ſpace the *Hindoo* village before mentioned ſtood in 1776. But cloſe to the ſea are the remains of a Pagoda built of brick, and dedicated to *Sìb*, the greateſt part of which has evidently been ſwallowed up by that element; for the door of the innermoſt apartment, in which the idol is placed, and before which there are always two or three ſpacious courts ſurrounded with walls, is now waſhed by the waves, and the pillar uſed to diſcover the meridian at the time of founding the Pagoda *, is ſeen ſtanding at ſome diſtance in the ſea.

* See Voyage du M. Gentil, Vol. I. Page 158.

In

In the neighbourhood of this building, there are ſome detached rocks, waſhed alſo by the waves, on which there appear ſculptures, though now much worn and defaced. And the natives of the place declared to the writer of this account, that the more aged people among them, remembered to have ſeen the tops of ſeveral Pagodas far out in the ſea, which being covered with copper (probably gilt) were particularly viſible at ſun-riſe, as their ſhining ſurface uſed then to reflect the ſun's rays, but that now that effect was no longer produced, as the copper had ſince become incruſted with mould and verdegreaſe.

Theſe circumſtances look much like the effects of a ſudden inundation, and the rent in the rock above deſcribed, makes it reaſonable to conjecture, that an earthquake may have cauſed the ſea to overflow its boundaries, and that theſe two formidable enemies, may have joined to deſtroy this once magnificent city. The account which the *Bramins*, natives of the place, gave of its origin and downfal, partly it ſhould ſeem on the authority of the *Mahabhârit*, and partly on that of later records, at the ſame time that it countenances this idea, contains ſome other curious particulars which may ſeem to render it worthy of attention. Nor ought it to be rejected on account of that fabulous garb, in which all nations, but eſpecially thoſe of the eaſt, have always clad the events of early ages.

" *Hirinácheren*, ſaid they, was a gigantick prince, that rolled up the earth into a " ſhapeleſs maſs, and carried it down to the abyſs, whither *Viſhnoo* followed him " in the ſhape of an hog, killed him with his tuſks, and replaced the earth in its " original ſituation. The younger brother of *Hirinácheren* was *Hirinakaſſap*, who " ſucceeded him in his kingdom, and refuſed to do homage to *Viſhnoo*. He had a " ſon named *Pralhaud*, who at an early age openly diapproved this part of his fa- " ther's conduct, being under the tuition of *Sokerâchârj*. His father perſecuted " him on this account, baniſhed him, and even ſought to kill him, but was pre- " vented by the interpoſition of heaven, which appeared on the ſide of *Pralhaud*. " At length *Hirinakaſſap* was ſoftened, and recalled his ſon to his court, where as " he ſat in full aſſembly, he began again to argue with him againſt the ſupremacy " of *Viſhnoo*, boaſted that he himſelf was lord of all the viſible world, and aſked " what *Viſhnoo* could pretend to more. *Pralhaud* replied, that *Viſhnoo* had no " fixed abode, but was preſent every where. Is he, ſaid his father, in that pillar? " Yes, returned *Pralhaud*. Then let him come forth, ſaid *Hirinakaſſap*; and riſing " from his ſeat, ſtruck the pillar with his foot; upon which *Viſhnoo*, in the " *Naraſinghah Awtár*, that is to ſay, with a body like a man, but an head like a

" lion,

" lion, came out of the pillar and tore *Hirinakaſſap* in pieces. *Viſhnoo* then fixed " *Pralhaud* on his father's throne, and his reign was a mild and virtuous one, " and as ſuch was a contraſt to that of his father. He left a ſon named *Namachee* " who inherited his power and his virtues, and was the father of *Balee*, the founder " of the once magnificent city of *Mahâbalipoor*, the ſituation of which is ſaid to be " deſcribed in the following verſe, taken from the *Mahabhârit*.

গঙ্গায়াঃ দক্ষিণেভাগে যোজনানাং শতদ্বয়ং—
পঞ্চযোজন মাত্রেণ পূর্ব্বাব্ধিবিস্তু পশ্চিমে——

The ſenſe of which is literally this:

" South of the *Ganges* two hundred Yojen
" Five Yojen * weſtward from the eaſtern ſea."

Such is the *Bramin* account of the *origin* of this place. The *ſequel* of its hiſtory, according to them, is as follows:

" The ſon of *Balee* was *Banâcheren*, who is repreſented as a giant with a " thouſand hands. *Anuredh*, the ſon of *Kriſhen*, came to his court in diſguiſe, and " ſeduced his daughter, which produced a war, in the courſe of which *Anuredh* was " taken priſoner, and brought to *Mahâbalipoor*, upon which *Kriſhen* came in perſon " from his capital *Duârikah*, and laid ſiege to the place. *Sîb* guarded the gates, and " fought for *Banâcheren*, who worſhipped him with his thouſand hands, but *Kriſhen* " found means to overthrow *Sîb*, and having taken the city cut off all *Banâcheren*'s " hands except two, with which he obliged him to do him homage. He conti- " nued in ſubjection to *Kriſhen* till his death, after which a long period enſued, in " which no mention is any where made of this place, till a Prince aroſe whoſe " name was *Malêcheren*, who reſtored the kingdom to great ſplendour and enlarged " and beautified the capital. But in his time the calamity is ſaid to have happened " by which the city was entirely deſtroyed, and the cauſe and manner of it, have " been wrapt up by the *Bramins*, in the following fabulous narration. *Malêcheren*, " ſay they, in an excurſion, which he made one day alone and in diſguiſe, came " to a garden in the environs of the city, where was a fountain ſo inviting, that " two celeſtial nymphs had come down to bathe there. The *Rajah* became

* The *Yojen* is a meaſure often mentioned in the *Shanſcrit* books, and according to ſome accounts is equal to nine, according to others twelve *Engliſh* miles. But at that rate the diſtance here mentioned, between this place and the *Ganges*, is prodigiouſly exaggerated, and will carry us far ſouth of *Ceylone*; this, however, is not ſurpriſing in an *Hindoo* poem, but from the ſecond line it ſeems pretty clear that this city at the time this verſe was compoſed muſt have ſtood at a great diſtance from the ſea.

" enamoured

" enamoured of one of them, who condefcended to allow of his attachment to
" her, and fhe and her fifter nymph ufed thenceforward to have frequent inter-
" views with him in that garden. On one of thofe occafions, they brought with
" them a male inhabitant of the heavenly regions, to whom they introduced the
" *Rajah*; and between him and *Malêcheren* a ftrict friendfhip enfued. In confe-
" quence of which he agreed, at the *Rajah*'s earneft requeft, to carry him in dif-
" guife to fee the court of the divine *Inder*, a favour never before granted to any
" mortal. The *Rajah* returned from thence, with new ideas of fplendour and
" magnificence, which he immediately adopted in regulating his court, and his re-
" tinue, and in beautifying his feat of government. By this means *Mahâbalipoor*
" became foon celebrated beyond all the cities of the earth, and an account of its
" magnificence having been brought to the gods affembled at the court of *Inder*,
" their jealoufy was fo much excited at it, that they fent orders to the God of the
" fea to let loofe his billows and overflow a place, which impioufly pretended to
" vie in fplendour, with their celeftial manfions. This command he obeyed, and
" the city was at once overflowed by that furious element, nor has it ever fince
" been able to rear its head."

Such is the mode in which the *Bramins* chufe to account for the fignal overthrow of a place, devoted to their wretched fuperftitions.

It is not, however, improbable, that the reft of this hiftory may contain, like the mythology of *Greece* and *Rome*, a great deal of real matter of fact, though enveloped in dark and figurative reprefentations. Through the difguife of thefe, we may difcern fome imperfect records of great events, and of revolutions that have happened in remote times, and they perhaps merit our attention the more, as it is not likely that any records of ancient *Hindoo* hiftory exift, but in this obfcure and fantaftic drefs. Their poets feem to have been their only hiftorians, as well as divines, and whatever they relate, is wrapped up in this burlefque garb, fet off, by way of ornament, with circumftances hugely incredible and abfurd, and all this without any date, and in no other order or method, than fuch as the poet's fancy fuggefted, and found moft convenient. Neverthelefs, by comparing names and grand events, recorded by them, with thofe interfperfed in the hiftories of other nations, and by calling in the affiftance of ancient monuments, coins, and infcriptions as occafion fhall offer, fome probable conjectures at leaft, if not important difcoveries, may, it is hoped, be made on thefe interefting fubjects. It is much to be regretted, that a blind zeal, attended with a total want of curiofity, in the *Mohammedan*

medan governors of this country, have been fo hoftile to the prefervation of *Hindoo* monuments and coins. But a fpirit of inquiry among *Europeans* may yet perhaps be fuccefsful, and an inftance which relates to the place above defcribed, though in itfelf a fubject of regret, leaves room to hope, that futurity may yet have in ftore fome ufeful difcoveries. The *Kauzy* of *Madras*, who had often occafion to go to a place in the neighbourhood of *Mahâbalipoor*, affured the writer of this account, that within his remembrance, a ryot of thofe parts had found, in plowing his ground, a pot of gold and filver coins, with characters on them which no one in thofe parts, *Hindoo* or *Mohammedan*, was able to decypher. He added, however, that all fearch for them would now be vain, for they had doubtlefs been long ago devoted to the crucible, as, in their original form, no one there thought them of any value.

The infcription on the Pagoda mentioned above, is an object, which, in this point of view, appears to merit great attention. That the conjecture, however, which places it among the languages of *Siam*, may not feem in itfelf chimerical, the following paffages from fome authors of repute, are here inferted to fhow, that the idea of a communication having formerly fubfifted between that country and the Coaft of *Choromandel*, is by no means without foundation, nay, that there is fome affinity, even at this day, between the *Balic* and fome of the *Hindoo* languages, and that the fame mode of worfhip feems formerly to have prevailed in the *Deckan*, which is now ufed by the *Siamefe*.

Monsieur de la Loubere, in his excellent account of *Siam*, fpeaks thus of the origin of the *Balic* language.

" The Siamefe, fays he, do not mention any country, where the Balic language, " which is that of their laws and their religion, is at prefent in ufe. They fuppofe, " indeed, on the report of fome among them, who have been on the Coaft of " Choromandel, that it bears fome refemblance to fome of the dialects of that " country, but they at the fame time allow, that the character in which it is " written, is not known but among themfelves. The fecular miffionaries fettled at " Siam believe that this language is not entirely a dead one; becaufe they have " feen in their hofpital, a man from the neighbourhood of Cape Comorin, who " mixed feveral Balic words in his difcourfe, declaring that they were in ufe in his " country, and that he himfelf had never ftudied nor knew any other than his " mother tongue. They at the fame time mention, as matter of certainty, that the religion

" religion of the Siamefe comes from thofe parts, as they have read in a Balic book " that Sommonacodom, the idol of the Siamefe, was the fon of a king of Ceylone *."

The language of the man mentioned in this paffage, who came from the neighbourhood of *Cape Comorin*, could be no other than the *Tamulic*; but the words here alluded to may very poffibly have been derivatives from the *Shanfcrit*, common to both that and the *Balic*.

In another part of the fame work, where the author treats of the hiftory of *Sommonacodom* at large, on the authority of the *Balic* books, he fays:

" The father of Sommonacodom, according to the fame Balic book, was a " king of Teve Lanca, that is to fay, of the famous Ceylone †."

Here it is obfervable that while the country of *Siam* feems to be utterly unknown, both to the natives of *Ceylone* and *Hindoftan*, *Ceylone* fhould neverthelefs be fo well known to the *Siamefe*, and under the fame appellation it bears in the *Shanfcrit*. An epithet is alfo here prefixed to it, which feems to be the fame as that ufed by the *Hindoos* in fpeaking of that ifland, for they alfo call it in *Shanfcrit* *Dêve Lanca* or *the Sacred Lanca*. From feveral paffages in the fame work it alfo appears, that the *Shanfcrit* word *Mahá*, which fignifies *great*, is conftantly ufed in the *Balic* language in the fame fenfe. And the names of the days of the week are moft of them the fame in *Shanfcrit* and in *Balic*, as may be feen in the following comparifon of them.

Shanfcrit.	*Balic.*	
Aditta-vâr,	Van Athit,	Sunday.
Soma-vâr,	Van ‡ Tchân,	Monday.
Mungela-vâr,	Van Angkaan,	Tuefday.
Bouta-vâr,	Van Pout,	Wednefday.
Brahfpati-vâr,	Van Prahout,	Thurfday.
Soucra-vâr,	Van Souc,	Friday.
Sany-vâr,	Van Sâoa,	Saturday.

* " Les Siamois ne nomment aucun pays, où la langue Bali, qui eft celle de leurs loix et de leur religion, foit " aujourd'hui en ufage. Ils foupçonnent à la vérité, fur la rapport de quelques-uns d'entre eux, qui ont été à la côte " de Coromandel, que la langue Balic a quelque refemblance avec quelqu'un des dialects de ce pays-là: mais ils con- " viennent en même temps que les lettres de la langue Balic ne font connues que chez eux. Les Miffion- " naires féculiers à Siam croyent que cette langue n'eft pas entièrement morte; parce qu'ils ont vu dans leur " hopital un homme des environs du Cap de Comorin, qui metoit plufieurs mots Balis dans fon langage, affirant " qu'ils etoient en ufage en fon pays, et que lui n'avoit jamais etudié et ne favoit que fa langue maternelle. Ils " donnent d'ailleurs pour certain que la religion des Siamois vient de ces quartiers-là, parce qu'ils ont lu dans un livre " Balic que Sommonacodom, que les Siamois adorent, etoit fils d'un Roi de l'ifle de Ceylone."

† " Le père de Sommonacodom etoit, felon ce même livre Bali, un Roi de Teve Lanca, c'eft à dire, un Roi de la " célébré Ceylan."

‡ Here one *Hindoo* word is fubftituted for another, for *Tchân* in *Hindoftany*, and *Tchänder* in *Shanfcrit*, fignify the moon as well as *Soma*.

 The

The ſame author gives, in another place, an account of a pretended print of a foot on a rock, which is an object of worſhip to the *Siameſe*, and is called *Prabât*, or the venerable foot. For *Prá* in *Balic*, he ſays, ſignifies *venerable*, which agrees with *prâper* and *prameſht* in *Shanſcrit*; and *Bát* in the ſame tongue is a foot, as *Pád* in *Shanſcrit*. After which he goes on to ſay:

"We know that in the iſland of Ceylone, there is a pretended print of a human "foot, which has long been held in great veneration. It repreſents, doubtleſs, the "left foot, for the Siameſe ſay that Sommonacodom ſet his right foot on their "*Prabat*, and his left foot at Lanca *."

From KNOX's hiſtory of *Ceylone* it appears, that the impreſſion here ſpoken of is upon the hill called by the *Chingelays Hamalell*, by *Europeans Adam's Peak*. And that the natives believe it to be the foot-ſtep of their great idol *Buddou*. Between the worſhip of whom, as deſcribed by KNOX, and that of *Sommonacodom*, as related by M. DE LA LOUBERE, there is a ſtriking reſemblance in many particulars, which it may be proper here to enumerate.

1ſt. Beſides the foot-ſteps above mentioned, there is a kind of tree (which from deſcription appears to be the *Pipel* tree, ſo well known in *India)*, which the *Chingelays* hold ſacred to *Buddou*, and the *Siameſe* to *Sommonacodom*. Inſomuch that the latter deem it meritorious to hang themſelves upon it. The *Chingelays* called it *Bogahah*; for *gahah*, in their language, ſignifies a tree, and *bo* ſeems to be an abbreviation of *Bod* or *Buddou*; and the *Siameſe* call it in *Balic*, *Pra ſi Mahà Pout*, which according to DE LA LOUBERE's interpretation, ſignifies the tree of the great *Pout* †. This he ſuppoſes to mean *Mercury*, for he obſerves that *Pout* or *Poot* is the name of that planet in the *Balic* term for *Wedneſday*; and in another place, he ſays, *Pout* is one of the names of *Sommonacodom*. It is certain that *Wedneſday* is called the day of *Bod* or *Budd* in all the *Hindoo* languages, among which the *Tamulic*, having no *b*, begins the word with a *p*, which brings it very near the *Balic* mode of writing it. It is equally certain that the days of the week in all theſe languages, are called after the planets in the ſame order as with us, and that *Bod*, *Budd*, or *Pood*, holds the place of *Mercury*. From all which it ſhould appear that *Pout*, which among the *Siameſe* is another name for *Sommonacodom*, is itſelf a corruption of *Buddou*, who is the *Mercury* of the *Greeks*. And it is ſingular

* "On ſait que dans l'iſle de Ceylan, il y a un pretendu veſtige de pied humain, que depuis long-temps y eſt en "grande veneration. Il repreſente ſans doute le pied gauche; car les Siamois diſent que Sommonacodom poſa le pied "droit à leur *prabat*, et le pied gauche à Lancà."

† In vulgar *Siameſe* they call it *Ton-pô*.

that,

that, according to M. DE LA LOUBERE, the mother of *Sommonacodom* is called in *Balic Maha-mania*, or the *great Mania*, which refembles much the name of *Maia*, the mother of *Mercury*. At the fame time that the *Tamulic* termination *en*, which renders the word *Pooden*, creates a refemblance between this and the *Woden* of the *Gothick* nations, from which the fame day of the week is denominated, and which on that and other accounts is allowed to be the *Mercury* of the *Greeks*.

2*dly*. The temples of *Sommonacodom* are called *Pihân*, and round them are habitations for the priefts refembling a college; fo thofe of *Boddou* are called *Vihâr*, and the principal priefts live in them as in a college. The word *Vihâr*, or as the natives of *Bengal* would write it *Bihâr*, is *Shanfcrit*; and *Ferifhtah*, in his hiftory of *Bengal*, fays, that this name was given by the *Hindoos* to the province of *Behâr*, becaufe it was formerly fo full of *Bramins* as to be, as it were, one great *feminary of Learning*, as the word imports.

3*dly*. The *Siamefe* have two orders of priefts, and fo have the worfhippers of *Buddou*. Both the one and the other are diftinguifhed by a yellow habit, and by another circumftance which muft be mentioned in the words of the refpective authors. KNOX fays of the *Buddou* priefts, "They have the honour of carrying "the *Tallipot* with the broad end over their heads foremoft, which none but the "king does." And M. DE LA LOUBERE fays of the *Siamefe* priefts, "To defend "themfelves from the fun they have the *Talapat*, which is their little umbrella in "the form of a fcreen *."

The word here ufed is common to moft of the *Hindoo* languages, and fignifies *the leaf of the Palmyra tree*. M. DE LA LOUBERE mentions it as a *Siamefe* word, without feeming to know its origin or primary fignification.

4*thly*. The priefts of *Buddou*, as well as thofe of *Sommonacodom*, are bound to celibacy, as long as they continue in the profeffion; but both the one and the other are allowed to lay it down and marry.

5*thly*. They both eat flefh, but will not kill the animal.

6*thly*. The priefts of either nation are of no particular tribe, but are chofen out of the body of the people.

Thefe circumftances plainly fhow that this is a fyftem of religion different from that of the *Vêds*, and fome of them are totally inconfiftent with the principles and practice of the *Bramins*. And indeed it is manifeft from KNOX's whole account,

* "Pour fe garentir du foleil ils ont le Talapat, qui eft leur petit parafol en forme d'ecran."

that

that the religion of the *Chingelays* is quite diftinct from that which prevails at this day among the *Hindoos,* nor does it appear that there is fuch a race of men as that of the *Bramins* among them. The only part in which there feems to be any agreement is in the worfhip of the *Debtahs,* which has probably crept in among them from their *Tamulian* neighbours, but that is carried on in a manner very different from the *Braminical* fyftem, and appears to be held by the nation at large in very great contempt if not abhorrence. KNOX's account of it is this: "Their temples "(i. e. thofe of the *Debtahs)* are, he fays, called *Covels,*" which is the *Tamulic* word for *Pagoda.* He then goes on to fay, "A man pioufly difpofed, builds a fmall houfe "at his own charge, which is the *temple*, and *himfelf becomes prieft thereof.* This houfe "is feldom called *God's Houfe,* but moft ufually *Jacco* the *Devil's.*" But of the prevailing religion he fpeaks in very different terms, and defcribes it as carried on with much parade and fplendour, and attended with marks of great antiquity. "The "Pagodas or temples of their Gods, fays he, are fo many that I cannot number them. "Many of them are of rare and exquifite work, built of hewn ftone, engraven with "images and figures, but by whom and when I could not attain to know, the in-"habitants themfelves being ignorant therein. But fure I am they were built by far "more ingenious artificers than the Chingelays that now are on the land. For the "Portuguefe in their invafions have defaced fome of them, which there is none "found that hath fkill enough to repair to this day." In another place, he fays, "Here are fome antient writings engraven upon rocks which puzzle all that fee "them. There are divers great rocks in divers parts in *Cande Uda,* and in the "northern parts. Thefe rocks are cut deep with great letters for the fpace of fome "yards, fo deep that they may laft to the world's end. No body can read them, "or make any thing of them. I have afked Malabars and Gentoos, as well as "Chingelays and Moors, but none of them underftood them. There is an antient "temple, Goddiladenni in Yattanour, ftands by a place where there are of thefe "letters." From all which the antiquity of the nation and their religion is fufficiently evident, and from other paffages it is plain, that the worfhip of *Buddou* in particular, has been from remote times a very eminent part of that religion; for the fame author, fpeaking of the tree at *Anurodgburro,* in the northern part of the ifland, which is facred to *Buddou,* fays, "The due performance of this worfhip "they reckon not a little meritorious: infomuch that, as they report, ninety kings "have reigned there fucceffively, where, by the ruins that ftill remain, it appears "they fpared not for pains and labour, to build temples and high monuments to "the

"the honour of this God, as if they had been born to hew rocks and great ftones, "and lay them up in heaps. Thefe kings are now happy fpirits, having merited "it by thefe labours." And again he fays, "For this God above all other, they "feem to have an high refpect and devotion," &c.

And from other authorities it will appear, that this worfhip has formerly been by no means confined to *Ceylone*, but has prevailed in feveral parts of *India* prior to that of the *Bramins*, nay that this has been the cafe even fo late as the ninth and twelfth centuries of the *Chriftian* Æra.

In the well-known * *Anciennes Relations*, tranflated from the *Arabick*, by that eminent Orientalift EUSEBIUS RENAUDOT, the *Arabian* traveller gives this account of the cuftom of dancing-women, which continues to this day in the *Decan*, but is not known among the *Hindoos* of *Bengal* or *Hindoftan* proper.

"There are in India publick women, called *women of the idol*, and the origin of "this cuftom is this: when a woman has made a vow for the purpofe of having "children, if fhe brings into the world a pretty daughter, fhe carries it to *Bod*, fo "they call the idol which they adore, and leaves it with him †."

This is a pretty juft account of this cuftom, as it prevails at this day in the *Decan*, for children are indeed devoted to this profeffion by their parents, and when they grow up in it, they are called in *Tamulic Devadáfi* or *female flaves of the idol*. But it is evident they have changed their mafter fince this *Arabian* account was written, for there is no idol of the name of *Bod* now worfhipped there. And the circumftance, of this cuftom being unknown in other parts of *India*, would lead one to fufpect, that the *Bramins*, on introducing their fyftem of religion into that country, had thought fit to retain this part of the former worfhip, as being equally agreeable to themfelves and their new difciples.

The fame *Arabian* travellers give us an account of a very powerful race of *Hindoo* kings, according to them indeed the moft powerful in *India*, who then reigned on the *Malabar* coaft with the title of *Balhára*. Their dominion appears to have extended over *Guzerat*, and the greateft part, if not the whole, of the antient kingdom of *Vifiapoor*. For the *Arabian* geographer quoted by M. RENAUDOT, makes *Nahelvárah* the metropolis of thefe princes, which is doubtlefs *Nahervalah*, the

* Anciennes relations des Indes et de la Chine, de deux voyageurs Mohametans, qui y allèrent dans le neuvième fiècle. *Paris*, 1718, 8vo.

† "Il y a dans les Indes des femmes publiques, appellés femmes de l'idole, l'origine de cette couftume eft telle: "Lors qu'une femme a fait un voeu pour avoir des enfans, fi elle met au monde une belle fille, elle l'apporte au *Bod*, "c'eft ainfi qu'ils appellent l'idole qu'ils adorent, auprès duquel elle la laiffe, &c." Anc. Rel. p. 109.

antient

antient capital of *Guzerat*, though M. RENAUDOT ſeems not to have known that place; and the reſt of the deſcription ſufficiently ſhows the great extent of their dominion ſouthward. M. D'ANVILLE ſpeaks of this race of kings on the authority of the *Arabian* geographer EDRISI, who wrote in the twelfth century, according to whom it appears that their religion was, even ſo late as that period, not the *Braminical*, but that of which we are now ſpeaking. M. D'ANVILLE's words are theſe: "Edriſi acquaints us with the religion which this prince profeſſed in ſaying, "that his worſhip was addreſſed to *Bodda*, who according to St. Jerome and "Clemens Alexandrinus was the founder of the ſect of the Gymnoſophiſts, in like "manner as the Bramins were uſed to attribute their inſtitution to Brahma *."

The authority of CLEMENS ALEXANDRINUS is alſo cited on the ſame ſubject by RELANDUS in his 11th Diſſertation, where, treating of the language of *Ceylone*, he explains the word *Vehâr*, above ſpoken of, in theſe terms:

"Vehâr ſignifies a temple of their principal God Buddou, who, as Clemens "Alexandrinus has long ago obſerved, was worſhipped as a God by the "Hindoos †."

After the above quotations, the following extract from the voyage of that inquiſitive and ingenious traveller M. GENTIL, publiſhed in 1779, is given as a further and very remarkable illuſtration of this ſubject.

"This ſyſtem is alſo that of the Bramins of our time; it forms the baſis of that "religion, which they have brought with them into the ſouthern parts of the "Peninſula of Hindoſtan, into Madura, Tanjore, and Maiſſore.

"There was then in thoſe parts of India, and principally on the Coaſt of Choro-"mandel and Ceylone, a ſort of worſhip, the precepts of which we are quite unac-"quainted with. The god Baouth, of whom at preſent they know no more in India "than the name, was the object of this worſhip; but it is now totally aboliſhed, "except that there may poſſibly yet be found ſome families of Indians, who have "remained faithful to Baouth, and do not acknowledge the religion of the Bra-"mins, and who are on that account ſeparated from and deſpiſed by the other caſts.

"I have not indeed heard that there are any ſuch families in the neighbourhood "of Pondichery, but there is a circumſtance well worthy of remark, which none "of the travellers that have treated of the Coaſt of Choromandel and Pondichery

* "L'Edriſi nous inſtruit ſur la religion que profeſſoit ce Prince, en diſant que ſon culte s'adreſſoit à Bodda, que "ſelon St. JEROME et St. CLEMENT D'ALEXANDRIE, avoit été l'inſtituteur des Gymnophiſtes comme les Brach-"manes rapportoient à Brahma leur inſtitut." Ant. Geog de l'Inde, p. 94.

† "*Vehâr*, templum dei primarii Buddoe βουττα quem Indos ut Deum venerari jam olim notavit Clemens Alexan-"drinus." Strom. lib. 1. p. 223. Rel. Diſs. pars tertia, p. 85.

"ſeem

" ſeem to have noticed. It is this, that at a ſhort league's diſtance to the ſouth of " this town, in the plain of Virapatnam, and pretty near the river, we find a ſtatue " of granite very hard and beautiful. This ſtatue, which is from three feet to three " and an half in heighth, is ſunk in the ſand to the waiſt, and weighs doubtleſs " many thouſand weight; it is, as it were, abandoned in the midſt of this extenſive " plain. I cannot give a better idea of it, than by ſaying, that it exactly agrees " with and reſembles the Sommonacodom of the Siameſe; its head is of the ſame " form, it has the ſame features, its arms are in the ſame attitude, and its ears are " exactly ſimilar. The form of this divinity, which has certainly been made in the " country, and which in no reſpect reſembles the preſent idols of the Gentoos, " ſtruck me as I paſſed this plain; I made various inquiries concerning this ſingular " figure, and the Tamulians one and all aſſured me that this was the god Baouth, " who was now no longer regarded, for that his worſhip and his feſtivals had been " aboliſhed, ever ſince the Bramins had made themſelves maſters of the people's " faith *."

M. Gentil then goes on to ſay a good deal more upon this ſubject, in the courſe of which he ſuppoſes, that this deity is the *Fo* of the *Chineſe*, whoſe worſhip, by their own accounts, was brought from *India*. And indeed the abridgment of the name *Pout*, mentioned in a note of this paper, which the vulgar *Siameſe* reduce to the ſingle ſyllable *Po*, ſeems to countenance this opinion. But as this is foreign to our preſent purpoſe, and the above paſſages, it is hoped, are ſufficient to eſtabliſh what was propoſed, it ſeems high time to take leave of this ſubject, with an apology for that prolixity, which is inſeparable from this kind of diſcuſſion.

17th June, 1784.

* " Ce ſyſtême eſt auſſi celui des Brames de nos jours: il fait la baſe de la religion qu'ils ont apportée dans le ſud " de le preſqu'iſle de l'Indoſtan, le Madure, le Tanjaour, et le Maiſſour.

" Il y avoit alors dans ces parties de l'Inde, et principalement à la côte de Coromandel et à Ceylan, un culte dont " on ignore abſolument les dogmes: le dieu Baouth, dont on ne connoit aujourd'hui, dans l'Inde, que le nom, etoit " l'objet de ce culte; mais il eſt tout-à-fait aboli, ſi ce n'eſt qu'il ſe trouve encore quelques familles d'Indiens ſéparées " et mépriſées des autres caſtes, qui ſont reſtées fidelles à Baouth, et qui ne reconnoiſſent point la religion des Brames.

" Je n'ai pas entendu dire qu'il y ait de ces familles aux environs de Pondichery; cependant, une choſe tres-digne de " remarque, et à laquelle aucun des voyageurs qui parlent de la côte de Coromandel et de Pondichery, n'ont fait " attention, eſt que l'on trouve à une petite lieue au ſud de cette ville, dans la plaine de Virapatnam, aſſez près de la " rivière, une ſtatue de *Granit* très-dur et très-beau: cette ſtatue, d'environ trois pieds à trois pieds et demi de hau- " teur, eſt enfoncée dans le ſable juſqu'à la ceinture, et peſe ſans doute pluſieurs milliers; elle eſt comme aban- " donnée au milieu de cette vaſte plaine: je ne peux mieux en donner une idée, qu'en diſant qu'elle eſt exactement " conforme et reſſemblante à *Sommonacodom* des Siamois; c'eſt la même forme de tête, ce ſont les mêmes traits dans " le viſage, c'eſt la même attitude dans les bras, et les oreilles ſont abſolument ſemblables. La forme de cette " divinité, qui certainement a été faite dans le pays, et qui ne reſſemble en rien aux divinités actuelles des Gentils, " m'avoit frappé lorſque je paſſai dans cette plaine; je fis diverſes informations ſur cette figure ſingulière, les Tamoults " m'aſſurèrent tous que c'etoit Baouth qu'on ne regardoit plus; que ſon culte et ſes fêtes etoient ceſſées depuis que les " Brames s'etoient rendus les maitres de la croyance du peuple."

VI. HINTS

VI.

HINTS RELATIVE TO FRICTION IN MECHANICKS.

By MR. REUBEN BURROW.

HYPOTHESIS.

IN the following eſtimation of friction, the weight or force neceſſary to overcome the reſiſtance, &c. is ſuppoſed to be proportional to the preſſure.

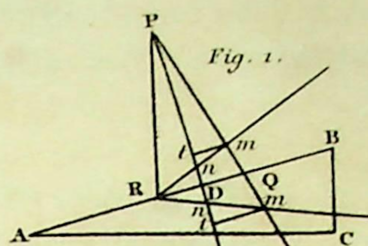
OF FRICTION IN THE INCLINED PLANE.

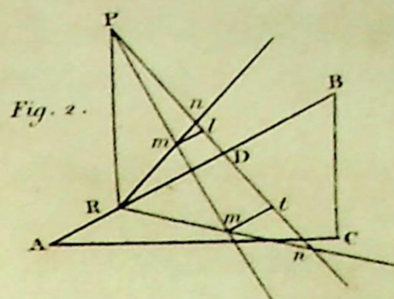
Let AB be an inclined plane *, and let PR repreſent a weight ſuſtained on it by any force Rm acting in the direction Rm; and draw PD perpendicular to AB, and let Rm meet PD in n: Now as Rn repreſents the force that would be neceſſary to ſuſtain the body, excluſive of friction, and Pn repreſents the preſſure againſt the plane; if mt be drawn perpendicular to PD meeting it in t, then will nm be the force neceſſary to overcome the friction in that direction, and Pt the real preſſure againſt the plane AB, when the whole force Rm neceſſary to overcome both the weight and the friction, acts in the direction Rm; and as the force nm is equivalent to nt and tm; and nt has no other effect than to alter the preſſure, therefore tm is the only force which overcomes the reſiſtance of friction; and as this force is as the preſſure, therefore tm is proportional to Pt, and hence the Locus of all the points m, is a right line.

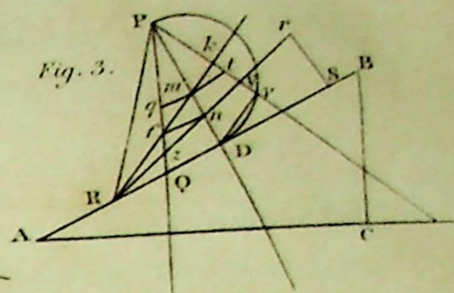
Again, ſuppoſe the body, inſtead of being drawn along, to be ſuſtained at reſt only upon the plane; this, it is evident, will require a leſs force than the other, becauſe the friction prevents the body in part from deſcending †: Let Rm be the force required, and let the ſame conſtruction be made as before; then becauſe Rn is the force that would be neceſſary if there was no friction; mn is the effect of the friction itſelf; but mn is equivalent to the forces mt and tn; and as Pn would be the preſſure excluſive of friction, Pt is the preſſure incluſive; and as the force loſt is as the friction, and mt is as the force loſt, therefore mt is as Pt, for the friction is as the preſſure; conſequently the Locus of all the points m is a right line paſſing

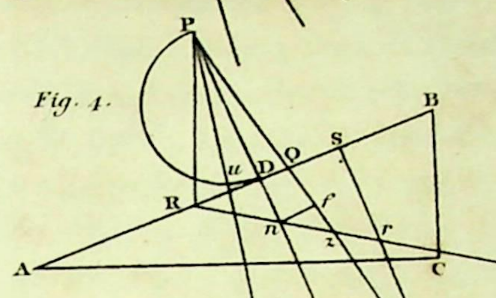
* Fig. 1. † Fig. 2.

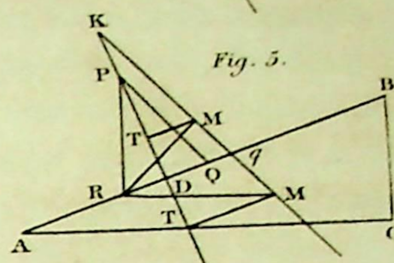
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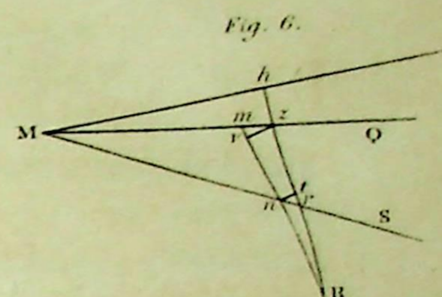

Fig. 1.

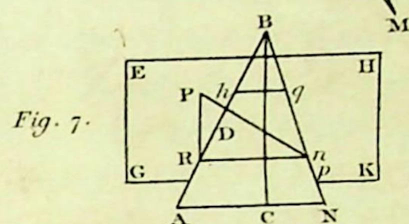

Fig. 2.

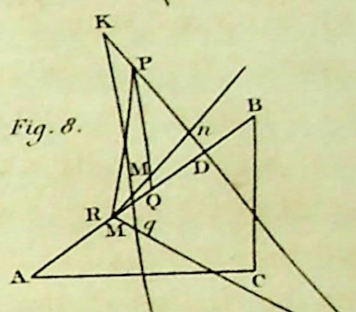

Fig. 3.

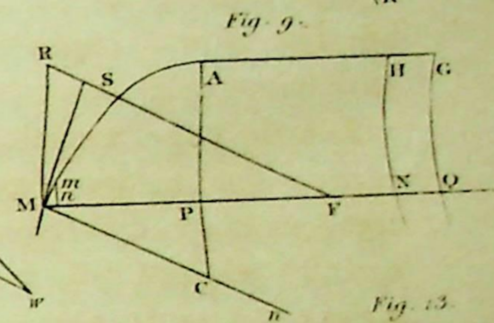

Fig. 4.

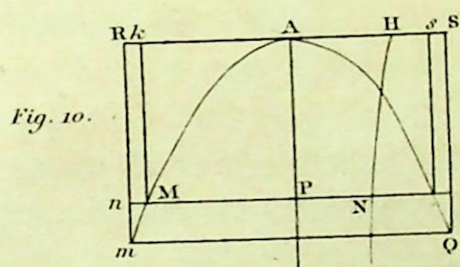

Fig. 5.

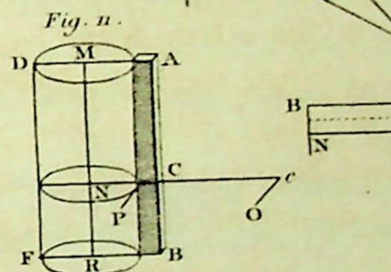

Fig. 6.

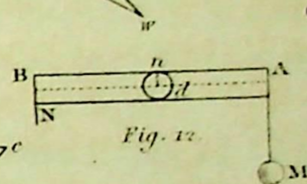

Fig. 7.

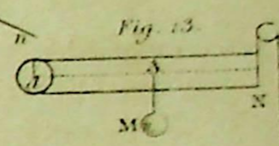

Fig. 8.

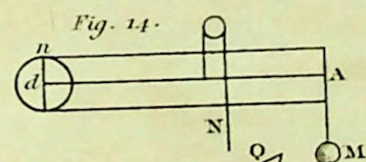

Fig. 9.

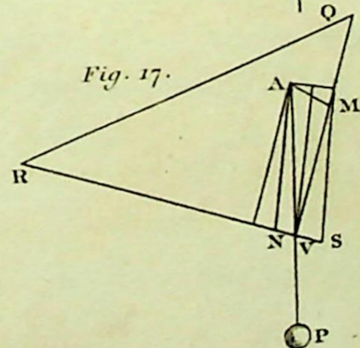

Fig. 10.

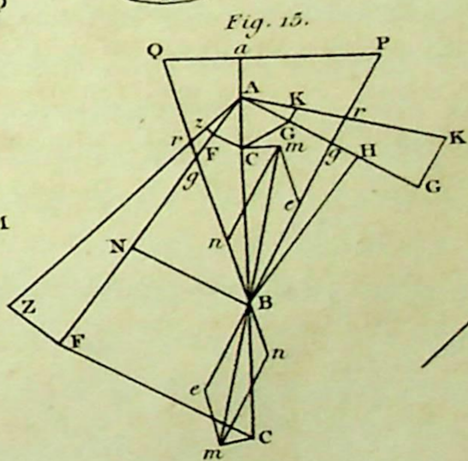

Fig. 11.

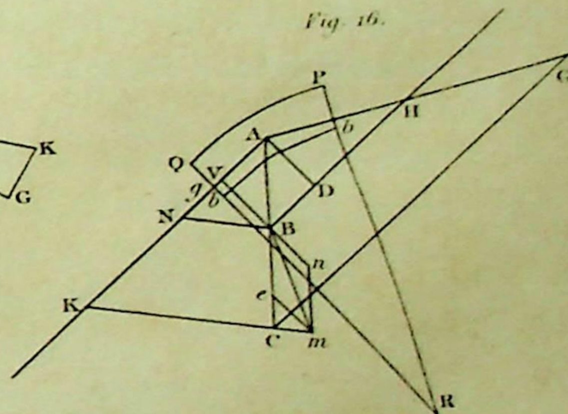

Fig. 12.


Fig. 13.


Fig. 14.


Fig. 17.


Fig. 15.


Fig. 16.

through P, and making the ſame angle as DPQ in the former caſe, and only differing by being drawn on the contrary ſide of PD.

SCHOLIUM.

In what follows, the force requiſite to ſuſtain any body is conſidered under three different diſtinctions; firſt, when it is juſt barely ſufficient to overcome the weight and reſiſtance ariſing from friction, and the body is conſidered as juſt beginning to move in the direction of the force applied, and the force in this caſe is called the *moving force:* ſecondly, when this force is diminiſhed till the body would begin to move or deſcend in a contrary direction if the force was diminiſhed farther; this laſt I call the *ſuſpending force*; and it is plain that whatever force is applied to the body leſs than the moving, and greater than the ſuſpending force, the body will remain at reſt: laſtly, it is manifeſt that there is an intermediate ſtate in which ſuch a degree of force may be applied, that the friction will have no effect either way; and this force is the ſame as would keep the body in equilibrio if there was no friction, becauſe the effect or tendency of friction is to keep the body at reſt, or prevent it from moving either way; this being premiſed there will be little difficulty in the following.

PROBLEM I.

Having given the weight of the body to be ſuſtained; the inclination of the plane and the ratio of the friction to the preſſure; to find the force requiſite to ſuſtain the weight in a given direction.

In the foregoing figures, draw PR and PD at right angles to the horizon and plane reſpectively, PR repreſenting the weight; take PD to DQ as the preſſure to the friction, and let DQ be taken upwards or downwards as the requiſite force is motive or ſuſpenſive; join PQ and draw the line Rm in the given direction meeting PQ in m; then Rm is the force required.

COROLLARY 1. If the friction be the n part of the preſſure, and W be the weight, s and c the ſine and coſine of the plane's elevation, then the moving force parallel to the plane will be W $(s + c : n)$, and the ſuſpending force W $(s - c : n)$.

COROLLARY 2. If the direction of the force be parallel to the horizon, and t be the tangent of the plane's elevation, then W $(tn + 1) : (n - t)$ will be the moving force, and W $(tn - 1) : (n + t)$ the ſuſpending force, and Wt the force excluding friction.

EXAMPLE. If the weight be a ton, the friction $\frac{1}{3}$ of the preſſure; AB=5,

O BC=3,

BC=3, and AC=4, then the moving force will be 3235 pounds; the suspending force 747 pounds, and the force excluding friction 1680 pounds; nearly.

PROBLEM II.

Given *the weight* of the body, the inclination of the plane, and the ratio of the *friction to the* pressure; to find the direction so that the sustaining force may be a given quantity, or the least possible.

Draw DQ and QP as before, and let PR be to Rm as the weight to the given force; then from the center R with a distance equal to Rm, intersect PQ in m; then Rm is the required direction when the force is given, but to have it the least possible draw Rm at right angles to PQ, then Rm is the direction required.

COROLLARY 1. An expression for the sustaining force, when the least possible, may be found as follows: in the triangles PDQ, RQm, the angle Q is common, therefore PQ : PD :: RQ : Rm; but PD is a fourth proportional to AB, AC, and PR, and DQ is to PD as 1 to n, supposing this the given ratio; also RD is a fourth proportional to AB, BC, and PR, consequently RQ is equal to DQ either added to, or subtracted from, DR, as it is the first, or second case; and because PQ : PD :: $\sqrt{(nn+1)} : n$ :: RQ : Rm, therefore Rm=PR $(n.BC \pm AC) : AB\sqrt{(nn+1)}$ or $(ns \pm cW : (\sqrt{nn+1})$, by substituting s and c for the natural sine and cosine of the plane's elevation, and using the negative or affirmative sign as the force required, is the moving or suspending one respectively.

EXAMPLE. If AB=5, BC=3, and AC=4, and the weight 1 ton; then the least moving and sustaining forces will be 1825 and 702 pounds respectively.

COROLLARY 2. Because the triangles PDQ and RQm are similar, and the ratio of PD to DQ constant to each fixed value of n; therefore the angle QRm being equal to DPQ, will also be constant whether the inclination of the plane be variable or not; and hence the angles of the direction with the plane for the draught to be made with the greatest advantage, are found for different values of n as follows:

n	QRm	n	QRm	n	QRm	n	QRm	n	QRm	n	QRm
	° ′		° ′		° ′		° ′		° ′		° ′
1	45.0	2	26.34	3	18.26	4	14. 2	5	11.19	6	9.28
$1\frac{1}{4}$	38.40	$2\frac{1}{4}$	23.58	$3\frac{1}{4}$	16.54	$4\frac{1}{4}$	13 15	$5\frac{1}{4}$	10.47	7	8. 8
$1\frac{1}{2}$	33.41	$2\frac{1}{2}$	21.48	$3\frac{1}{2}$	15.57	$4\frac{1}{2}$	12.32	$5\frac{1}{2}$	10.18	8	7. 8
$1\frac{3}{4}$	29.45	$2\frac{3}{4}$	19.59	$3\frac{3}{4}$	14.56	$4\frac{3}{4}$	11.53	$5\frac{3}{4}$	9.52	9	6.20

N. B.

N. B. The direction, or angle QRm, is to be taken below the plane for the ſuſpending, and above the plane for the moving force.

Scholium. Though at firſt ſight the former part of the above problem which ſhews the beſt method of applying an active force, ſeems ſuperior to the other, yet on farther conſideration the other appears of equal conſequence, and particularly in building and faſtening walls, banks of earth, and fortifications, &c. and the application of what are called *Land-ties*, &c. Thus if a weight, for inſtance, is to be drawn along the plane RB, and the friction be $\frac{1}{3}$ of the preſſure, the beſt direction is when Rm makes an angle of 18°.26′ *above* the plane; but if the weight is a quantity of earth or ſtone, or any thing to be ſuſpended, as in the caſe of land-ties, the beſt angle (on the foregoing ſuppoſition) muſt be 18°.26′ *below* the plane.

SCHOLIUM.

In thoſe propoſitions the friction is eſtimated according to the moſt generally received opinion, that the reſiſtance is proportional to the whole preſſure compounded of the weight of the body, and the additional force neceſſary to overcome the friction; but it has been aſſerted that there may be caſes where the friction is not proportional to the whole preſſure, but to that which would ariſe if the body was ſuſtained in a given direction excluſive of friction; and that there might alſo be caſes, where the reſiſtance ariſing from tenacity or coheſion might be as the relative preſſure againſt the plane, and the force to overcome it the ſame in every direction; ſomething ſimilar to a globe ſtuck faſt in wet tenacious clay: I ſhall therefore give ſolutions to both caſes.

In the firſt caſe *, the force requiſite to ſuſtain the body in direction RV excluſive of friction is Rn; and as Rn is equivalent to RD and Dn, therefore Pn is the preſſure excluſive of friction; and as the friction is the n part of the preſſure, the force acting parallel to AB to overcome it is the n part of Pn; but the force which acting in direction Rn will be equivalent to the n part of Pn in the direction Rn, is a fourth proportional to n times RD, Pn, and Rn; but becauſe DQ is the n part of DP, therefore fn is the n part of Pn, and the fourth proportional aforeſaid will be nz; conſequently the ſum or difference of Rn and nz muſt be a given quantity, or the leaſt poſſible: the problem therefore is reduced † to drawing a line Rn from the given point R, meeting the two lines PD and PQ given in poſi-

* Fig. 3. † Fig. 4.

tion

tion in n and z, ſo that nz added to or taken from Rn, the ſum or difference may be a given quantity, or the leaſt poſſible. To do this, let DS be taken equal to DR, and draw Sr parallel to PD meeting PQ in M; then becauſe Rn is equal to rn, the ſum or difference of the quantities aforeſaid is rz; and when rz is required to be a given quantity, the queſtion is reduced to that particular caſe of the inclinations of *Appollonius*, in ſolids, which has been reſolved by *Newton* and *Barrow*; the limits of the problem or the mode of drawing the line Rr, ſo that the intercepted part rz may be the leaſt poſſible, may be inveſtigated as follows:

* Suppoſe it done, and Rrz the poſition required, and let Rnm be indefinitely near to Rz, and Mh perpendicular to Rz; then by applying the analyſis of the ancients to the *Newtonian* doctrine of prime and ultimate ratios, mn is equal to zr; and if from the center R with the diſtances Rz and Rn, the arcs zv and nt be ſuppoſed to be deſcribed, vn is equal to zt, and conſequently tr equal to mv; but rt : tn :: rh : Mh, and tn : zv :: Rr : Rz, and zv : vm :: Mh:hz, whence by compounding the proportions, tr : vm :: Rr . rh : Rz . zh, and as the two firſt terms are equal, the laſt are equal, and conſequently Rr : Rz :: zh : rh, and dividing Rr : rz :: zh : rz, therefore Rr is equal to zh, and conſequently the point h is in an hyperbola, whoſe aſymptotes are QM and SM produced: but becauſe the angle MhR is a right angle, the point h is alſo in the circumference of a circle, therefore a line drawn from R to h, the point where the hyperbola and circle interſect, is the poſition required.

In the other caſe, where the reſiſtance ariſing from tenacity or coheſion, is ſuppoſed to be as the relative preſſure againſt the plane, and the force to overcome it the ſame in each direction; we have Rn for the ſuſtaining force excluſive of friction; and the n part of Pn for the friction, and conſequently the ſum or difference of theſe is the expreſſion for the whole force; and the problem may be thus conſtructed. Take PD to DQ as the preſſure to the friction, and join PQ; on PD deſcribe a circle, in which take Dv equal to DQ; join Pv and draw RV perpendicular to it: then RV will repreſent the direction and meaſure of the whole force, when it is the leaſt poſſible.

For DQ and Dv are equal, and conſequently nf is equal to Vn; but DQ is the n part of DP, therefore nf or Vn is the n part of Pn, and conſequently RV is equal to the ſum or difference of Rn, and the n part of Pn; but RV is the leaſt poſſible by conſtruction, and therefore the other is a minium alſo. For draw any

* Fig. 6.

other

other line Rk meeting RV in k and PD in m; and draw mq, mt parallel to DQ and Dv; then the ſum or difference of Rm and mt is equal to the ſum or difference of Rm and mq; but the ſum or difference of Rm and mt is greater than RV, and therefore the ſum or difference of Rn, and the n part of Pn, is the leaſt poſſible.

PROBLEM III.

Given the weight of the body; the inclination of the plane, and the force ſuſtaining the body in a given direction; to find the ratio of the friction to the preſſure.

Take PR as before (ſee Fig. 1. 2.), draw Rm in the given direction, and take PR to Rm as the weight of the body to the force ſuſtaining it; draw Pm meeting AB in Q; and PD perpendicular to AB; then PD is to DQ as the preſſure to the friction.

PROBLEM IV.

If AhqN be the ſegment of an equilateral triangle, which by moving parallel to itſelf, and the horizon, generates a ſolid, upon which a figure hmGEHKpqh moves touching the former in hm and qp; required the effect *of the friction*; ſtill ſuppoſing it the n part of the preſſure.

Let P be the center of gravity of half the body *, and PR its weight as before; then the body, by means of its inflexibility, is kept together in the ſame manner as if it was actuated by a force parallel to the horizon; but if PDn be perpendicular to Ah, and Rn parallel to the horizontal line AC, meeting PD in n; Pn will be the preſſure againſt the ſide Ah, and the friction is the n part of Pn; but PR : Pn : : AC : AB, therefore if AC repreſent the weight of half the body, the n part of AB will expreſs the weight requiſite to overcome the friction for that half; and by doubling the expreſſions they ſerve for the whole: wherefore let W repreſent the weight of the body; ſ the ſecant of the angle BAC; then *Wſ* will be the preſſure againſt the plane AD; and the n part of Wſ the force neceſſary to overcome the friction; and as this laſt is the force neceſſary to draw the body along a horizontal plane, therefore the force neceſſary to draw the body along a horizontal plane, is to that neceſſary to draw it along the body whoſe ſection is AhqN, as AC to AB, or as 1 to *ſ*.

* Fig. 7.

Becauſe

Becaufe when the angle CAB is given, the ratio of PR to Pn is conftant, therefore when the folid whofe fection is AhqN is elevated, making an angle with the horizon, fo that its bafe forms an inclined plane; PR in that cafe reprefents the preffure in a normal direction to that plane, and Pn the preffure againft the folid; and as the *friction* is increafed in the ratio of the preffure, therefore if the preffure, which the body would have on the inclined plane, be increafed in the ratio of AC to AB, or radius to the fecant of the angle CAB, then the preffure on the angular plane or body, whofe perpendicular fection is AhqN will be had, and confequently its n part, or the friction. Hence this conftruction *; let PR reprefent the weight; then PD at right angles to AB, reprefents the preffure that the body would exert againft the common inclined plane; take DK to DP as AB in the foregoing figure to AC, or as the fecant of the inclination of the angular plane with its bafe to radius; let Dq be the n part of DK, and join Kq; then RM drawn any how to meet Kq in M, gives RM for the meafure of the whole force in that direction; and it is the moving or fufpending force according as Dq is taken upwards or downwards in the line AB.

It is evident that Kq is parallel to PQ, and therefore though the leaft force (which is perpendicular to Kq) differ from that in the former cafes; yet the directions for having the greateft effect are ftill the fame as in the foregoing table: the demonftration is in effect the fame as the firft.

Corollary. By fuppofing f to be the fecant of the angle †, that the fides of the angular plane make with the bafe; proceeding as Corollary 2d of Problem 1ft, and putting t for the natural tangent of the plane's inclination, and W for PR the weight, we have W $(tn+f):(n-t)$ for the moving; and W $(tn-f):(n+t)$ for the fufpending force, neceffary to draw the body along the angular inclined plane by a force acting parallel to the bafe of the plane.

Example. Let AB, BC, and AC, be 5, 3, and 4 refpectively, and let the inclination of the fides be 45°; the weight of a ton and the friction one third of the preffure; then 3648 pounds is the moving, and 499 the fufpending force.

SCHOLIUM.

In this propofition, thofe parts of the plane on which the body moves, are fup-

* Fig. 5. † Fig. 8.

pofed

pofed rectilineal, as moftly happens in practice; but the friction is eafily eftimated in curvilinear furfaces, and may be found generally as follows:

Let AMP * be half the fection perpendicular to the horizon, and to the axis of the folid which forms the curvilineal plane on which the body is moved; AP the axis; PM the ordinate, and MS a tangent to the curve at the point M; alfo let RM reprefent the weight or preffure in a direction perpendicular to the horizon at the point M; and let RF be perpendicular to MS meeting MP in F; alfo let PN be taken equal to MR, and PQ equal to RF; and fuppofe the fame conftruction to be made for every point of the curve, and let HN be the locus of all the points N, and GQ the locus of all the points Q; then will the friction when drawn along the horizontal plane, be to the friction of the fame body when drawn along the curvilinear plane in the fame direction, as the area APNH to the area APQG.

For the friction on the horizontal plane being as the fum of the preffures, is as the fum of all the elementary lines MR or PN; that is, as the area AHNP; and the friction on the curvilinear plane is, for the fame reafon, as the fum of all the RF or PQ, namely as the area APQG: hence the truth of the propofition is manifeft.

Corollary 1. Becaufe Mn or the fluxion of y is to Mm the fluxion of the curve, as MR or PN to RF or PQ, therefore if PN be a function of AP, PQ will be a fourth proportional to the fluxion of the ordinate, the fluxion of the curve AM, and this function; wherefore if the curves HN and AM be given; the nature of the curve GQ will be known, and its area may be found by the common methods of quadratures.

Corollary 2. It is evident, that when the planes are inclined to the horizon, the frictions of the right and curvilinear planes are ftill in the fame ratio as in the preceding cafes, and confequently may be found by the fame mode of proceeding.

Corollary 3. It is alfo evident, that the above method holds good whether the parts of the body are connected together or not, with refpect to their motion in the direction RM, fo long as each elementary part MR may be confidered as fuftained at the point M by a force parallel to MP; but when the body is rigid or inflexible the cafe becomes more fimple, for MR is then conftant, and APNH becomes a parallelogram.

Corollary 4. By fuppofing given properties to exift in any two of the curves AM, HN, or GQ, the nature of the third will be known; and hence a number

* Fig. 9.

number of problems relative to friction, may be proposed and resolved by a proper application of the direct and inverse methods of fluxions.

PROPOSITION 5. THEOREM.

In the application of forces to overcome friction, the same allowances must be made for the forces acting to advantage or disadvantage by means of levers or other mechanical powers as are made in the common doctrine; for instance if a weight of two pounds, by acting at the distance of one foot from the fulcrum of a lever, be sufficient to overcome the friction, then one pound at two feet distance will have the same effect, &c.

This is too evident to need a demonstration.

OF FRICTION IN THE SCREW.

As any force acting perpendicular to the direction of a moving body does not affect the motion of the body in that direction; so the force acting perpendicular to the axis of the screw, has no effect on the motion of a body raised thereby exclusive of friction; it therefore requires the same force to raise a body by means of a screw, as to raise the same body in equal time along an inclined plane of the same elevation, as the threads of the screw by means of a force acting parallel to the base of the inclined plane: now, if we suppose the weight so contracted or condensed as to be capable of being placed on one of the threads of the screw, and fastened to an imaginary lever always perpendicular to its axis: then it is evident, this lever will have no effect but to change the direction of the weight, and keep it in the midst of the thread of the screw; and if a force be applied at the weight always perpendicular to this lever, so as to sustain or draw it along, this force will be determined exactly the same as was done before in the inclined plane: but the rigidity of the parts of the "female screw" serves exactly the same purpose as this imaginary lever, and makes the weight act upon the threads like a body sustained on an inclined plane by a force parallel to its base; and as the force to overcome both the weight and the friction, is reciprocally as the distance from the center of the axis, therefore the distance of the power from the center of the axis, is to the distance from the same center to the middle of the threads of the screw, as the force necessary to sustain the body on the inclined plane, to the same force in the screw at the distance of the power. The same proportion holds good whether the threads be cut perpendicular to

to the axis or in an angle; for in the firſt, the common plane is to be taken, and in the ſecond, the inclined or angular one conſidered in the fourth propoſition: Wherefore if d be the diſtance from the center of the axis to the middle of the threads of the ſcrew; D the diſtance of the ſame center to the point where the force is applied; the force to overcome the weight and friction is Wd $(tn \pm f)$: $(n \mp t)$ D, where the letters expreſs the ſame things as before, and the upper ſign is for the moving, and the lower for the ſuſpending force. N. B. t is the natural tangent of the angle made by a line touching one of the threads, and a plane at right angles to the axis of the ſcrew; or it is equal to the diſtance of the reſpective edges of two threads, divided by the circumference of the cylinder, out of which the ſcrew is cut.

COROLLARY 1. When lines drawn from the center of the axis of the ſcrew to coincide with the threads, are at right angles to the axis, the above expreſſion becomes $Wd\ (t \pm n1)$: $(n \mp t)$ D, for f becomes radius or unity.

COROLLARY 2. When n is equal to t, the moving force will be infinite; alſo the ſuſpending force will be nothing when t is the n part of f; and when $Wd\ (tn - f) : (n \pm t)\ D$, becomes negative it expreſſes the quantity of force, which muſt act in a contrary direction to reduce the body juſt to a ſtate of ſuſpenſion.

SCHOLIUM.

It would be needleſs to make any allowance for the curvilinear ſurfaces of the threads of ſcrews, as they ſeldom differ much from the two foregoing forms; neither is it of much conſequence to allow for their parts being at different diſtances from the axis, as their breadth ſeldom bears any conſiderable ratio to the length of the levers by which they act; but the caſe is different when large bodios revolve on each other, and therefore it will be neceſſary to ſhew the mode of proceeding in ſuch caſes.

Let MmAQ be a convex ſolid generated by the revolution of the curve MAQ, about its axis perpendicular to the horizon; and MRSQ a concave body exactly fitting it; then if this laſt body be revolved about the axis AP by means of the lever Pf, the force neceſſary to overcome the friction of one body turning upon the other may be found as follows: ſuppoſe the revolving body divided into an infinite number of concentric tubes, that may deſcend independent of each other, and preſs freely againſt the body on which they revolve, and yet be ſo connected that the lever Pf,

* Fig. 10.

may give the ſame angular velocity at the ſame time to each; alſo let the ordinates PN of the curve HN, repreſent the weight or preſſure (in a direction perpendicular to the horizon) of each of the indefinitely ſmall parts Mk, or elementary lines of the body at the diſtance PM from the axis; and let c be the circumference of a circle whoſe radius is unity: Then, becauſe the friction of each of the elementary tubes *MRSQ* is as its preſſure; and the preſſure is as the number of lines Mk and the preſſure of each; therefore as this number is as PM.Mn.c, we have the n part of this expreſſion for the force which acting at M would overcome the friction of the cylindrical tube, if moved round upon a horizontal plane; but as the preſſure of each elementary part is increaſed in the ratio of Mn to Mm, when moved on the the ſolid MAQ, the real force will be (PM.c.Mm.PN) : n; Alſo Pf : PM :: (PM.c. Mm.PN) : n to the ſmall elementary force which will overcome the laſt force when acting at f; conſequently the whole force will be equal to the fluent of (PM^2.PN. Mm.c) : (n.Pf).

Corollary. By means of the curves AM, HN, &c. concluſions may be drawn *ſimilar* to thoſe in the corollaries to the ſcholium of the fourth propoſition.

OF FRICTION IN THE LEVER.

It has been already obſerved, that a force acting perpendicular to the direction of a body, in motion does not alter the body's motion in that direction; therefore if * we ſuppoſe DB to be an upright cylinder, and AB a body touching it in a line as in the figure, and retained cloſe to it by an imaginary force drawing it perpendicular towards the axis: then if a force CP be applied to C, the center of gravity of AB, and be always ſuppoſed to act perpendicularly to the radius CN drawn from the center of the axis to the point C, the friction will be the ſame in drawing the body round the cylinder, as in drawing it along a horizontal plane with an equal preſſure; and if it be moved round by a force acting at a greater diſtance, the force will be reciprocally as the diſtance; on the contrary, if the body AB be fixed, and the cylinder turned round about its axis, the friction will be the ſame as if the cylinder was fixed, and the body drawn round it by CP as before: Likewiſe the friction is the ſame, whether the cylinder be fixed and the body AB moved round the axis MR by a force Qc applied at c; or whether the point c be fixed with AB faſtened to Cc, and the cylinder be revolved in a circle whoſe center is c, ſo as always to retain its parallelijm with reſpect to any fixt object; and as this laſt caſe obtains in all the axletrees of carriages, ſince every point of the wheel's contact with the ground

* Fig. 11.

may

may be conſidered as the center of motion for that inſtant, therefore the effect of the reſiſtance ariſing from the friction of the concave part of the nave upon the axletree, is to the effect that would ariſe from drawing the ſame weight over a horizontal plane of the ſame kind as the parts that rub each other, as the radius of the axis, to the radius of the wheel: It muſt be obſerved that this is not the only friction to which carriages are ſubject, for there is another part ariſing from the coheſion of the wheel and the ground at their contact, which is to be found and allowed for by the three firſt propoſitions.

In the above, the preſſure and friction have been ſuppoſed to be as the weight, as it is on a horizontal plane; but by the ſcholium to the fourth propoſition, it is plain that the preſſure is greater than the weight, and may be ſo in any proportion; however, as it appears by calculation that the preſſure on an arc of ninety degrees is to that on its chord only as 1,183 to 1, when both the concave and convex parts have exactly the ſame curvature; the difference will be ſo trifling, when the cylinders have different curvatures as uſual, as to require very ſeldom to be allowed for.

This being premiſed, let M ‡ be a weight placed at the point A of a lever moveable about an axis whoſe center is d and radius dn; and let N be the ſuſtaining force acting at B: Now it is evident that the preſſure on the axis d, differs ſo little from the weight, that it may be ſafely taken for it without any conſiderable error, except in ſome remarkable caſes which may be allowed for from what has been ſaid already; and therefore the friction which ought in ſtrictneſs to be taken as the n part of the preſſure, will here be taken as the n part of the weight upon the axis: Now if N be taken for the force which acting at B would be juſt ſufficient to keep the weight M at A, in equilibrio, excluſive of friction; and if W be the additional force to be added to N ſo as to overcome the friction; then will M+P, M−P, and P−M, be the weight upon the axis at d in the firſt, ſecond, and third figures reſpectively (ſuppoſing the ſum of M and N to be equal to P); now as the friction is the n part of each of theſe quantities, and its effect is to keep the lever in a ſtate of reſt; therefore in whatever direction the force at N endeavours to draw the lever by acting at B, the friction tends to counteract that force by keeping the lever ſteady or acting in a contrary direction at n; and as the effect of the friction, and the additional force W, are in equilibrio; and the friction acts by means of the lever dn, and the force W by the lever dB; therefore Bd is to dn, as the ſum or difference of the n part of $N+W$ and M, is to W; conſequently $W = dn\ (M+N) : (n.Bd - dn)$, in the

‡ Fig. 12, 13, 14.

firſt

firft figure; $W = dn\,(M - N) : (n.Bd + dn)$, in the fecond figure; and in the third figure, $W = d\,(N - M) : (n.Bd - dn)$: all thefe are the expreffions for the moving forces.

To find the fufpending forces, or the forces which acting at N fhall be juft fufficient to prevent the weight M from defcending: Let M and N be the fame as before, and let w be the force which taken from N, will leave a force juft fufficient to prevent M from defcending; then the weight upon d, in the firft figure will be $M + N - w$; in the fecond figure, the weight will be $M - N + w$; and in the third figure, $N - M - w$; and by proceeding as before, the values of w in the fufpending forces, are $dn\,(M+N):(n.Bd+dn)$; $dn(M-N):(n.Bd-dn)$, and $dn(N-M):(n.Bd+dn)$, in the firft, fecond, and third figures, refpectively.

Becaufe Bd:dA::M:N, therefore if this value of N be fubftituted in each of the above expreffions for the friction; the whole force capable of fuftaining the friction and weight M will be had: thus for example, the moving force to overcome the friction and weight M in the firft figure, will be $M\,(n.dA+dn):(n.Bd-dn)$, and the fufpending force $M\,(n.dA-dn):(n.Bd+dn)$, in the fecond figure, the moving force will be $M\,(n.dA+dn):(n.Bd+dn)$, and the fufpending force $M\,(n.dA-dn):(n.Bd-dn)$; and in the third figure, the moving force will be $M\,(n.dA-dn):(n.Bd-dn)$, and the fufpending force will be $M\,(n.dA+dn):(n.Bd+dn)$.

The method of finding n from each of the above equations is evident, and confequently the ratio of the friction to the preffure by experiments.

ON FRICTION IN THE WEDGE.

Let AC * be the force neceffary to fuftain the wedge QPB in the direction aB perpendicular to QP, friction included; and let AB be the force exclufive of friction: draw AN and AH perpendicular to the BQ and BP; CG parallel to AN, and CF parallel to AH: Now GA and AF, the forces of the wood againft the fide of the wedge, in thofe directions, compound a force equivalent to the diagonal CA in the direction CA, and therefore a force reprefented by AC in that direction, muft be applied to the head of the wedge at a to overcome thefe forces: Let gr be the n part of Ag, and let the lines Ar be drawn, and alfo GK and FZ perpendicular to AG and AF meeting the lines Ar in K and Z; then will GK and FZ reprefent the friction againft the fides BP and BQ, being each the n part of AG and AF, the preffure againft each fide, refpectively; wherefore if Be be taken in PB, and Bn in

* Fig. 15.

BQ,

BQ, equal to GK and FZ refpectively, the forces Be and Bn in thofe directions muft compound a force to which the force BC in the direction BC muft be equivalent, and confequently if Bm be the force compounded of Be and Bn ; and Cm be joined, Cm muft be perpendicular to mB ; fince Be or GK is the force of friction arifing from the preffure againft BP, which tends to prevent the wedge from moving either in the direction BP or PB ; and Bn or FZ has a fimilar effect with refpect to the direction in the line BQ ; and by hypothefis BC is juft fufficient to balance thefe forces : It is alfo evident from what was faid concerning the inclined plane, that Be and Bn muft be taken in the directions PB and QB for the moving force, but in the directions BP and BQ for the fufpending force.

The method of calculation is evident ; for as aB, AG, and AF, are perpendicular to QP, BP, and BQ, the triangles QPB and CAG are fimilar, and the parallelogram Bnme fimilar to FAGC ; whence by fuppofing certain parts given, the reft may be found, &c.

COROLLARY. When the wedge is ifofceles the point m falls on C, and Be is equal to Bn, and therefore Be or GK is equal to (AB+BC)PB) : (n.QP) ; but PB : Ba :: 2Be : BC, and therefore BC=2Ba (AB+BC) : (n.QP) or equal to (2Ba.BA) : (n. QP − 2Ba), and therefore AC=(n.QP.AB) : (n.QP − 2Ba), and by following the fame method for the fufpending force, we find BC=(2Ba.AB) : (n.QP+2Ba), and confequently AC is equal to (n.QP.AB) : (n.QP+2Ba).

SCHOLIUM.

By proceeding in a fimilar method, the forces of the arch-ftones of bridges, &c. may be determined ; for let QbbP be a ftone fuftained by the parts of the arch preffing againft Pb and Qb, and let A be its center of gravity, and AB perpendicular to the horizon ; alfo let AB and AC be the fame as before : then becaufe the body is in equilibrio, the force in direction AC will be equivalent to the force in a contrary direction, arifing from the preffures againft the body in the directions GA and KA, together with the force of friction ; and becaufe the preffures are AG and AK, if Be (the n part of AG) be drawn parallel to PB ; and Bn (the n part of AK) be drawn parallel to Qb ; and the parallelogram Bnme be completed, and Cm joined ; Bm will be the force arifing from friction, and the angle BmC a right angle ; the adjacent figure * is for the moving force, but the method is fimilar for the fufpenfive force ; and it is evident that the one conftruction is of ufe to determine the

* Fig. 15.

force

force which tends to break an arch by preſſing it downwards, and the other, the force that tends to break it upwards.

But as that excellent mathematician P. FRISI in his *Inſtituzioni di Meccanica*, has objected to the diviſion of the force AB into the forces AN and AH, and thence concluded BELIDOR and COUPLET to have been miſtaken on that account in their writings upon bridges; I ſhall, therefore, prove that the common method is really a conſequence of what that gentleman himſelf allows, and that his objections are not well founded. In the firſt place he allows the force AB to be equivalent to the forces AV and AD or VB; now (excluding friction) if that part of the arch which touches Pb was removed, it is evident QbbP would immediately begin to deſcend along Qb with a force repreſented by VB or AD; but this deſcent is prevented by that part of the arch which touches Pb, and therefore the force of that arch in the direction HA, muſt be ſuch as to be equivalent to DA in the direction DA or BV; but no force greater or leſs than HA will be equivalent to DA in the direction DA, and therefore HA is the real preſſure or force againſt Pb: again, HD is the preſſure in a perpendicular direction to Qb ariſing from this force; and as AV is the preſſure againſt Qb ariſing from the force AB, therefore AV together with HD is the whole preſſure againſt Qb in the direction AV; but becauſe the body is in equilibrio, and conſequently the action or force in the direction AV equal to the reaction in a contrary direction; therefore AV+HD or AN (becauſe NV is equal to HD by the property of the parallelogram) repreſents the preſſure againſt Qb, and AH the preſſure againſt Pb; which is contrary to what P. FRISI aſſerts, and agreeable to the uſual method.

The ſame learned Author has made another very material miſtake from a ſimilar cauſe at page 67 of the aforeſaid treatiſe, relative to the tenſion of ropes; which cannot be attributed to haſte or inadvertency, as he expreſsly aſſerts the holders of the common opinion to be miſtaken, in conſequence of their uſing the theory of compoſition of forces without ſufficient precaution: I ſhall therefore, after giving his own words, take the liberty of ſhewing where I apprehend he is miſtaken.

"Parleremo più a lungo delle altre ricerche matematiche, alle quali ha dato occaſione la controverſia inſorta intorno alla cupola di S. Pietro. Coll' occaſione che ſi è diſcorſo in Milano di munire la fabbricca del Duomo di un Conduttore elettrico, che dalla cima dell' aguglia ſi dirimaſſe, e ſcendeſſe per differenti parti del tempio, ſi è ancora parlato dell azione, che i fili del Conduttore potrebbero eſercitare contra l'aguglia, e ſi ſono propoſti varj Problemi intorno alle tenſioni delle funi. Io qui aggiu-

aggiugneró le ſoluzioni, che ho ritrovato, e incommincieró dalla prima riſoluzione delle forze tendenti, la quale ſiccome é interamente differente da quella, que hanno ſeguitato altri Autori, coſi non ſará meravaglia che porti dei riſultati interamente differenti da quelli che ſono ſtati ſinora publicati. Penda il * filo QVR, dai punti Q,edR, e vi ſi attacchi in V il peſo P. ſi produca la verticale PV in A ; ſi eſprima il peſo P colla retta AV, e dal punto A ; ſi tirino ſopra QV, RV le perpendicolari AM, AN. Sara MV l'intera forza eſercitata ſecondo QV, ed NV ſará quella che ſi eſerciterá ſecondo RV.

" La ſteſſa coſa ſi dedurrebbe riſolvendo la forza AV nelle due Aq, Ar parallele ai fili QV, RV, e poi riſolvendo di nuovo la forza Aq nelle due AN, Nq, e ſimilmente la Ar in due altre AM, Mr. Mentre conqueſte riſoluzioni é manifeſto che la forza totale eſercitata nel tendere il filo QV dev'eſſere Aq—Mr=rV—Mr=MV, e la tenſione del filo RV=Vq—Nq=NV.

" S'ingannerebbe chi miſuraſſe ſeparatamente la tenſione del filo QV dalla forza Aq, oſſia rV, e la tenſione di RV da Ar, oppure da qV. Egli è vero, che le due tenſioni equivalgono inſieme come alla ſola forza AV, così ancora alle due Ar, Aq, oppure alle quattro inſieme AN, Nq, AM, Mr. ma nel prendere le tenſioni ſeparate biſogna in oltre avvertire, che quando l'angolo QVR non è retto, una porzione di Aq agiſce ſecondo RV, ed una porzione di Ar ſecondo QV : e ſeparando le azioni ſara MV, la tenſione del filo QV, ed NV quella di RV."

In the firſt place I ſhall demonſtrate the truth of the eſtabliſhed method from principles that FRISI has himſelf allowed ; and ſecondly, point out the abſurdity of his concluſions.

1. Let Vn and Sr be parallel to AN ; then becauſe NVn is a right angle, and the force VA may be reſolved into VN and Vn, in thoſe directions, therefore if RV and VP were to remain in the ſame poſition, and the force which now keeps the body ſuſpended by acting in the direction VQ, was to act in the direction Vn with a force expreſſed by Vn ; it is then granted that the equilibrium would ſtill be maintained, and the tenſions would be as Vn and VN ; and therefore as no force VS whatever acting at V in the direction RV, can have any effect in the direction Vn perpendicular to RV, it neceſſarily follows that the force in any other direction VQ muſt be ſuch as to be equivalent to Vn in the direction Vn ; but it is likewiſe granted that no other force but Vr in the direction VQ can be equivalent to Vn in

* Fig. 17.

the

the direction Vn; and as the force Vr is equivalent to Vn and VS; and as VS, or its equal qN, only gives an additional tenfion to NV, the tenfion which the cord RV was fuppofed to have before, which whole tenfion is equal to the reaction of the tack R; therefore qV is the tenfion of the cord RV, and Vr that of Qv.

2. Let the points Q and R coincide, and RV, QV, and VP, will then be perpendicular to the horizon; and if VQ or VR be affumed to exprefs the weight P; then will the points A, R, Q, M, and N coincide; and according to Frisi's principle, the tenfions of RV, VQ, and VP, will be equal; but from the well known principle of the pulley, each cord VQ and VR bears but half the weight P, and therefore this abfurdity follows, that a cord is as much ftretched with half the weight as it would with the whole.

Again, if the points R, V, and Q, be fuppofed horizontal, it follows from the common theory that the tenfion of the rope RVQ would be infinite; but VN and VM vanifh when RVQ is horizontal, and therefore by Frisi's principle, the tenfion in that cafe would be nothing at all; but it is well known from the moft common experiments to be very confiderable, even when RQV is but nearly horizontal, and therefore the new theory of this great mathematician is indefenfible.

Remark. All the foregoing except the laft fcholium, was written in 1775, before the author had feen any thing to fpeak of on the fubject; he had defigned, and executed great part of an extenfive treatife on friction according to different hypothefes; but as no body would be at the rifk of publifhing it, and he could not afford it himfelf, the moft of it was accidentally loft; what is here given is an extract only of fome of the firft part, where velocity was not taken into the account, and where there were no complicated algebraic or fluxional expreffions which would be difficult to print in this country.

TO

TO THE HONOURABLE SIR WILLIAM JONES,

President of the Asiatick Society.

SIR,

I HAVE the honour to obey the orders of the Honourable the Governor General and Council, in transmitting to you, for the information of the *Asiatick Society*, an extract of a letter addressed to the Governor General, on the 2d of last month, by Lieutenant SAMUEL TURNER, who was appointed on an embassy to *Tibet*, and a copy of an account enclosed in it of Mr. TURNER's interview with TEESHOO LAMA, at the Monastery at *Terpaling*.

I have the honour to be, with great respect,

Sir,

Your most obedient and most humble servant,

E. HAY, *Secretary.*

COUNCIL CHAMBER,
Political Department, *April* 13, 1784.

EXTRACT OF A LETTER FROM MR. SAMUEL TURNER TO THE HONOURABLE THE GOVERNOR GENERAL, DATED PATNA, 2d MARCH, 1784.

DURING my residence in *Tibet*, it was an object I had much at heart to obtain an interview of the infant TEESHO LAMA, but the emperor of *China*'s general orders, restricting his guardians to keep him in the strictest privacy, and prohibiting indiscriminately the admission of all persons to his presence, even his votaries, who should come from a distance, appeared to me an obstacle almost insurmountable; yet, however, the Rajah, mindful of the amity subsisting between the Governor and him, and unwilling, I believe, by any act to hazard its interruption, at length consented to grant me that indulgence. As the meeting was attended with very singular and striking circumstances, I could not help noting them with most particular attention;

attention; and though the repetition of ſuch facts, interwoven and blended as they are with ſuperſtition, may expoſe me to the imputation of extravagance and exaggeration, yet I ſhould think myſelf reprehenſible to ſuppreſs them; and while I diveſt myſelf of all prejudice and aſſume the part of a faithful narrator, I hope, however tedious the detail I propoſe to enter into may be found, it will be received with candour, and merit the attention of thoſe for whoſe peruſal and information it is intended, were it only to mark a ſtrong feature in the national character, of implicit homage to the great religious ſovereign, and to inſtance the very uncommon, I may ſay almoſt unheard of, effects of early tuition.

I ſhall, perhaps, be ſtill more juſtified in making this relation, by adverting to that very extraordinary aſſurance, the Rajah of *Teeſhoo Loomboo* made me but a few days before my departure from his court, which, without further introduction, I will beg leave literally to recite.

At an interview he allowed me, after having given me my audience of leave, ſaid he, "I had yeſterday a viſion of our tutelary deity, and to me it was a day "replete with much intereſting and important matter. This guardian power, who "inſpires us with his illuminations on every momentous and great occaſion, in-"dulged me with a divination, from which I have collected that every thing will be "well; ſet your heart at reſt, for though a ſeparation is about to take place between "us, yet our friendſhip will not ceaſe to exiſt; but through the favour of inter-"poſing providence you may reſt aſſured it will encreaſe, and terminate eventually "in that which will be for the beſt."

I ſhould have paid leſs regard to ſo ſtrange an obſervation but for this reaſon, that however diſſonant from other doctrines their poſitions may be found, yet I judge they are the beſt foundation to build our reliances upon, and ſuperſtition combining with inclination to implant ſuch friendly ſentiments in their minds will ever conſtitute, the opinion having once obtained, the ſtrongeſt barrier to their preſervation. Oppoſed to the prejudices of a people, no plan can reaſonably be expected to take place: agreeing with them, ſucceſs muſt be the reſult.

A true extract,

E. HAY, *Secretary to the Governor General and Council.*

COPY

VII.

COPY OF AN ACCOUNT GIVEN BY MR. TURNER OF HIS INTERVIEW WITH TEESHOO LAMA AT THE MONASTERY OF TERPALING, ENCLOSED IN MR. TURNER'S LETTER TO THE HONOURABLE THE GOVERNOR GENERAL, DATED PATNA, 2d MARCH, 1784.

ON the 3d of December, 1783, I arrived at *Terpaling*, ſituated on the ſummit of a high hill, and it was about noon when I entered the gates of the Monaſtery, which was not long ſince erected for the reception and education of TEESHOO LAMA. He reſides in a palace in the center of the Monaſtery, which occupies about a mile of ground in circumference, and the whole is encompaſſed by a wall. The ſeveral buildings ſerve for the accommodation of three hundred *Gylongs* appointed to perform religious ſervice with TEESHOO LAMA, until he ſhall be removed to the Monaſtery and Muſnud of *Teeſhoo Loomboo*. It is unuſual to make viſits either here or in *Bootan* on the day of arrival: we therefore reſted this day, only receiving and ſending meſſages of compliment.

On the 4th in the morning, I was allowed to viſit TEESHOO LAMA, and found him placed in great form upon his Muſnud; on the left ſide ſtood his father and mother, on the other the officer particularly appointed to wait upon his perſon. The Muſnud is a fabrick of ſilk cuſhions piled one upon the other until the ſeat is elevated to the height of four feet from the floor; an embroidered ſilk covered the top, and the ſides were decorated with pieces of ſilk of various colours ſuſpended from the upper edge and hanging down. By the particular requeſt of of TEESHOO LAMA's father, Mr. SAUNDERS and myſelf wore the *Engliſh* dreſs.

I advanced, and, as is the cuſtom, preſented a white pelong handkerchief, and delivered alſo into the LAMA's hands the Governor's preſent of a ſtring of pearls and coral, while the other things were ſet down before him. Having performed the ceremony of the exchange of handkerchiefs with his father and mother, we took our ſeats on the right of TEESHOO LAMA.

A multitude of perſons, all thoſe ordered to eſcort me, were admitted to his preſence

prefence and allowed to make their proftrations. The infant LAMA turned towards them, and received them all with a chearful and fignificant look of complacency. His father then addreffed me in the *Tibet* language, which was explained to me by the interpreter, that TEESHOO LAMA had been ufed to remain at reft until this time of the day, but he had awoke very early this morning, and could not be prevailed on to remain longer in bed, for, added he, "the *Englifh* Gentle- "men were arrived, and he could not fleep." During the time we were in the room, I obferved the LAMA's eyes were fcarce ever turned from us, and when our cups were empty of tea, he appeared uneafy, and throwing back his head and contracting the fkin of his brow, he kept making a noife, for he could not fpeak, until they were filled again. He took out of a golden cup, containing confects, fome burnt fugar, and ftretching out his arm made a motion to his attendants to give them to me. He then fent fome in like manner to Mr. SAUNDERS, who was with me. I found myfelf, though vifiting an infant, under the neceffity of faying fomething, for it was hinted to me, that notwithftanding he is unable to reply, it is not to be inferred that he cannot underftand. However, his incapacity of anfwering excufed me many words, and I juft briefly faid, That the Governor General on receiving the news of his deceafe in *China*, was overwhelmed with grief and forrow, and continued to lament his abfence from the world until the cloud that had overcaft the happinefs of this nation by his re-appearance was difpelled, and then, if poffible, a greater degree of joy had taken place than he had experienced of grief on receiving the firft mournful news. The Governor wifhed he might long continue to illumine the world with his prefence, and was hopeful that the friendfhip which had formerly fubfifted between them would not be diminifhed, but rather that it might become ftill greater than before, and that by his continuing to fhew kindnefs to my countrymen, there might be an extenfive communication between his votaries, and the dependants of the *Britifh* nation. The little creature turned, looking fteadfaftly towards me with the appearance of much attention while I fpoke, and nodded with repeated, but flow movements of the head, as though he underftood and approved every word, but could not utter a reply. The parents, who ftood by all the time, eyed their fon with a look of affection, and a fmile expreffive of heartfelt joy at the propriety of the young LAMA's conduct. His whole regard was turned to us; he was filent and fedate, never once looking towards his parents, as if under their influence at the time; and with whatever pains his manners may have

have been formed ſo correct, yet I muſt own his behaviour on this occaſion appeared perfectly natural and ſpontaneous, and not directed by any action or ſign of authority.

The ſcene in which I was here brought to take a part was too new and extraordinary, however trivial, if not abſurd, as it may appear to ſome, not to claim from me great attention and conſequently minute remark.

TEESHOO LAMA is at this time about 18 months of age. He did not ſpeak a word, but made moſt expreſſive ſigns, and conducted himſelf with aſtoniſhing dignity and decorum. His complexion is of that hue which in *England* we ſhould term rather brown, but not without colour. His features good—ſmall black eyes—an animated expreſſion of countenance—and altogether I thought him one of the handſomeſt children I had ever ſeen. I had but little converſation with the father. He told me he had directions to entertain me three days on account of TEESHOO LAMA, and entreated me with ſo much earneſtneſs to paſs another on his own account, that I could not reſiſt complying with his requeſt. He then invited us for to-morrow to an entertainment he propoſed to make at a ſmall diſtance from the Monaſtery, which invitation having accepted, we took our leave and retired.

In the courſe of the afternoon I was viſited by two officers of the LAMA's houſehold, both of whom are immediately attendant on his perſon. They ſat and converſed with me ſome time, enquired after Mr. BOGLE, whom both of them had ſeen; and then remarking how extremely fortunate it was the young LAMA's having regarded us with very particular notice, obſerved on the very ſtrong partiality of the former TEESHOO LAMA for the *Engliſh*, and that the preſent one often tried to utter the name of the *Engliſh*. I encouraged the thought, hopeful that they would teach the prejudice to ſtrengthen with his encreaſing age, and they aſſured me that ſhould he, when he begins to ſpeak, have forgot, they would early teach him to repeat the name of HASTINGS.

On the morning of the 6th, I again waited on TEESHOO LAMA to preſent ſome curioſities I had brought for him from *Bengal*. He was very much ſtruck with a ſmall clock, and had it held to him, watching for a long time the revolutions of the moment hand; he admired it, but with gravity and without any childiſh emotion. There was nothing in the ceremony different from the firſt day's viſit. The father and mother were preſent. I ſtaid about half an hour, and retired to return and take leave in the afternoon.

The votaries of TEESHOO LAMA already begin to flock in numbers to pay their adorations

adorations to him. Few are yet admitted to his prefence. Thofe who come efteem it a happinefs if he is but fhewn to them from the window, and they are able to make their proftrations before he is removed. There came to-day a party of *Kilmaaks (Calmuc Tartars)* for purpofes of devotion and to make their offerings to the LAMA. When I returned from vifiting him, I faw them ftanding at the entrance of the fquare in front of the palace, each with his cap off, his hands being placed together elevated, and held even with his face. They remained upwards of half an hour in this attitude, their eyes fixed upon the apartment of the LAMA, and anxiety very vifibly depicted in their countenances. At length, I imagine, he appeared to them, for they began altogether by lifting their hands, ftill clofed, above their heads, then bringing them even with their faces, and after lowering them to their breafts, then feparating them: to affift them in finking and rifing, they dropt upon their knees and ftruck their heads againft the ground. This with the fame motions was repeated nine times. They afterwards advanced to deliver their prefents, confifting of talents of gold and filver, with the products of their country, to the proper officer, who having received them, they retired apparently with much fatisfaction.

Upon enquiry I learnt that offerings made in this manner are by no means unfrequent, and in reality conftitute one of the moft copious fources from which the LAMAS of *Tibet* derive their wealth.

No one thinks himfelf degraded by performing thefe humiliations. The perfons I allude to who came for this devout purpofe, were attendant on a man of fuperior rank, that feemed to be more engroffed than the reft in the performance of the ceremony. He wore a rich fatin garment lined with fox fkins, and a cap with a toffel of fcarlet filk flowing from the centre of the crown upon the fides all round, and edged with a broad band of *Siberian* fur.

According to appointment I went in the afternoon to make my laft vifit to TEESHOO LAMA. I received his difpatches for the Governor General, and from his parents two pieces of fatin for the Governor, with many compliments.

They prefented me with a veft lined with lambfkins, making many affurances of a long remembrance, and obferving that at this time TEESHOO LAMA is an infant and incapable of converfing, but they hoped to fee me again when he fhall have become of age. I replied that by favour of the LAMA I might again vifit this country, I looked forward with anxiety to the time when he fhould mount the Mufnud, and fhould then be extremely happy in the opportunity of paying my refpects.

reſpects. After ſome expreſſions and proteſtations of mutual regard, my viſit was concluded: I received the handkerchiefs and took my leave: and am to purſue my journey towards *Bengal* to-morrow at the dawn of day.

(Signed) SAMUEL TURNER.

A true Copy,

E. HAY, *Secretary to the Governor General and Council.*

To SIR WILLIAM JONES, KNIGHT,

Preſident of the Aſiatick Society.

SIR,

THE Honourable the Governor General having received and laid before the Board a Letter addreſſed to him by Lieutenant SAMUEL TURNER, containing the Account of a Journey made to *Teeſhoo Loomboo* by a *Goſſeyn* named POORUNGEER, and the circumſtances of his reception by TEESHOO LAMA; and the Board deeming it worthy of the attention of the *Aſiatick Society*, I have the honour, in obedience to their directions, to tranſmit to you a copy of it.

I have the honour to be,

Sir,

Your moſt obedient humble Servant,

E. HAY, *Secretary.*

FORT WILLIAM,
Secret Department, *Feb.* 22, 1786.

VIII. AN

VIII.

AN ACCOUNT OF A JOURNEY TO TIBET.

TO THE HONOURABLE JOHN MACPHERSON, Esq.

GOVERNOR GENERAL, &c. &c. &c.

Fort William.

HONOURABLE SIR,

HAVING, in obedience to the inſtructions with which you were pleaſed to honour me, examined POORUNGEER, the *Goſſeyn*, who has at different times been employed in deputations to the late TEESHOO LAMA, formerly accompanied him to the court of *Pekin*, and who is lately again returned from *Tibet*, and having collected from him ſuch an account of the journey he has juſt performed, and other information as he could give me relative to the countries he has left; I beg leave to ſubmit it to you in the following narrative.

In the beginning of laſt year POORUNGEER, having received diſpatches from Mr. HASTINGS, a ſhort time previous to his departure from *Bengal*, for TESHOO LAMA and the Regent of *Teſhoo Loomboo*, immediately ſet about preparing for the diſtant journey he had engaged to undertake which employed him until the beginning of the following month of March, when I beg leave to recal to your remembrance I had the honour to preſent him to you for his diſmiſſion. He then commenced his journey from *Calcutta*, and early in the month of April had paſſed, as he relates, the limits of the Company's Provinces, and entered the mountains that conſtitute the kingdom of *Bootan*, where, in the proſecution of his journey, he received from the ſubjects of the DAIB RAJA, the moſt ample and voluntary aſſiſtance to the frontier of his territory, nor met with any impediment to oppoſe his progreſs until he came upon the borders of *Tibet*. Here he was compelled to halt for near a fortnight by a heavy fall of ſnow, that commenced upon his arrival, and continued inceſſantly for the ſpace of ſix days, covering the face of the country to ſo great a depth as totally to put a ſtop to all travelling, and render it impracticable for him to proceed until a thaw ſucceeded to open the communication. During the time of

of his confinement at *Phari*, he fays, fuch was the feverity of the cold, and the injurious effect fo rapid a tranfition from a temperate climate had on the health of himfelf and his companions, that it left him little room to doubt if an early change had not fortunately taken place and permitted his advance, that they muft all have fallen victims to the inclemency of the weather.

However, as early as it was poffible for him to leave *Phari*, he proceeded by long ftages on his journey, and without encountering any further difficulty, on the 8th of May following, reached *Tefhoo Loomboo*, the capital of *Tibet*. Immediately upon entering the Monaftery, he went to the Durbar of the Regent PUNJUR INTINNEE NEMOHEIN to announce his arrival and the purpofe of his commiffion. Quarters were then allotted for his refidence, and an hour fixed for him to wait upon TESHOO LAMA; who he was informed the following morning intended to leave the palace to occupy one of his gardens, fituated on the plain within fight of the Monaftery, where it was vifible a confiderable encampment had been formed. The LAMA quitted his apartment at the firft dawn of day, and was lodged in the tents pitched for his accommodation before the fun had rifen.

In the courfe of the morning, at the hour appointed for his admiffion, POORUNGEER went down to the LAMA's tents. He heard, on entering the gates of the enclofure, that the young LAMA was taking his recreation in the garden, ranging about, which became with him a very favourite amufement. As it was at this time in *Tibet* the warmeft part of the year, that he might enjoy the benefit of the air, his attendants had chofen a fpot where the trees afforded a complete fhade to place an elevated feat of cufhions, for the young LAMA, after his exercife, to reft upon. In this fituation POORUNGEER found him, when fummoned to his prefence, attended by the Regent, his parents, SOOPOON CHOOMBOO, the cup bearer, and the principal officers of the court. After making three obeifances at as remote a diftance as it was poffible, POORUNGEER approached, and prefented to the LAMA, according to the cuftom of *Tibet*, a piece of white pelong, and then delivered the letters and prefents with which he had been charged. The packages were all immediately opened before the LAMA, who had every article brought near to him, and viewed them feparately one by one. The letter he took into his own hand, himfelf broke the feal, and taking from under the cover a ftring of pearls, which it enclofed, ran them over between his fingers, as they read their rofaries, and then with an arch air placed them by his fide, nor would, while the narrator was in his prefence, permit any one to take them up. POORUNGEER fays, the young LAMA regarded him with a very kind

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and ſignificant look, ſpoke to him in the *Tibet* language, and aſked him if he had had a fatiguing journey. The interview laſted more than an hour, during all which time the LAMA ſat with the utmoſt compoſure, not once attempting to quit his ſeat, nor diſcovering the leaſt forward uneaſineſs at his confinement. Tea was twice brought in, and the LAMA drank a cup each time. When ordered to accept his diſmiſſion, POORUNGEER approached the LAMA, and bowing before him, preſented his head uncovered to receive his bleſſing, which the young LAMA gave by ſtretching out his hand and laying it on his head. He then ordered him for as long as he reſided at *Teeſhoo Loomboo* to come to him once every day.

The following morning POORUNGEER waited upon the regent at his apartments in the palace, to whom, after obſerving the cuſtomary forms of introduction, he delivered his diſpatches. After this he viſited SOOPOON CHOOMBOO, the LAMA's parents, and others to whom he was before known, and ſays he experienced from all quarters the moſt cordial and kind reception; for they had been long uſed to conſider him as an agent of the Government of *Bengal.* He found no change whatever to have enſued in the adminiſtration ſince his attendance upon me in *Tibet.* The country enjoyed perfect tranquillity, and the only event that had taken place of importance in their annals was the inauguration of the infant LAMA, which happened the preceding year; and as this conſtitutes a concern of the higheſt moment, whether conſidered in a political or religious point of view, being no leſs than the recognizance in an infant form of their re-generated immortal ſovereign and eccleſiaſtical ſupreme, I was induced to beſtow more than common pains to trace the ceremonies that attended the celebration of ſuch a great event, conceiving that the novelty of the ſubject might render the account curious, if even it ſhould be found to contain no information of real utility. I ſhall therefore, without further apology, ſubjoin the reſult of my enquiries, premiſing only that my authority for the deſcription is derived principally from POORUNGEER, and confirmed, with ſome additional particulars, by the concurring reports of a *Goſſeyen*, who was at the time himſelf preſent on the ſpot.

The Emperor of *China* appears on this occaſion to have aſſumed a very conſpicuous part, in giving teſtimony of his reſpect and zeal for the great religious father of his faith. Early in the year 1784, he diſmiſſed ambaſſadors from the court of *Pekin* to *Teeſhoo Loomboo*, to repreſent their ſovereign in ſupporting the dignity of the high prieſt, and do honour to the occaſion of the aſſumption of his office. DALAI LAMA and the Viceroy of *Laſſa*, accompanied by all the court, one of the *Chineſe* Generals,

rals, ſtationed at *Laſſa* with a part of the troops under his command, two of the four magiſtrates of the city, the heads of every Monaſtery throughout *Tibet*, and the Emperor's ambaſſadors, appeared at *Teeſhoo Loomboo* to celebrate this epocha in their theological inſtitutions. The 28th day of the ſeventh moon, correſponding nearly, as their year commences with the vernal equinox, to the middle of October, 1784, was choſen as the moſt auſpicious for the ceremony of inauguration : a few days previous to which the LAMA was conducted from *Terpaling*, the Monaſtery in which he had paſſed his infancy, with every mark of pomp and homage that could be paid by an enthuſiaſtick people. So great a concourſe as aſſembled either from curioſity or devotion was never ſeen before, for not a perſon of any condition in *Tibet* was abſent who could join the ſuite. The proceſſion was hence neceſſarily conſtrained to move ſo ſlow, that though *Terpaling* is ſituated at the diſtance of twenty miles only from *Teeſhoo Loomboo*, three days expired in the performance of this ſhort march. The firſt halt was made at *Tſondue*; the ſecond at *Summaar*; about ſix miles off whence the moſt ſplendid parade was reſerved for the LAMA's entry on the third day; the account of which is given me by a perſon who was preſent in the proceſſion. The road, he ſays, was previouſly prepared by being whitened with a waſh, and having piles of ſtones heaped up, with ſmall intervals between, on either ſide. The retinue paſſed between a double row of prieſts, who formed a ſtreet extending all the way from *Summaar* to the gates of the palace. Some of the prieſts held lighted rods of a perfumed compoſition, that burn like decayed wood, and emit an aromatick ſmoke; the reſt were furniſhed with the different muſical inſtruments they uſe at their devotions, ſuch as the gong, the cymbal, hautboy, trumpets, drums, and ſea ſhells, which were all ſounded in union with the hymn they chanted. The croud of ſpectators were kept without the ſtreet, and none admitted on the high road but ſuch as properly belonged to or had a preſcribed place in the proceſſion, which was arranged in the following order.

The van was led by three military commandants or governors of diſtricts at the head of 6 or 7000 horſemen armed with quivers, bows, and matchlocks. In their rear followed the ambaſſador, with his ſuite, carrying his diploma, as is the cuſtom of *China*, made up in the form of a large tube, and faſtened on his back. Next the *Chineſe* General advanced with the troops under his command, mounted and accoutred after their way with fire arms and ſabres; then came a very numerous group bearing the various ſtandards and inſignia of ſtate; next to them moved a full band of wind and other ſonorous inſtruments; after which were led two horſes richly capariſoned,

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each carrying two large circular ftoves difpofed like panniers acrofs the horfe's back and filled with burning aromatick woods. Thefe were followed by a fenior prieft, called a *Lama*, who bore a box containing books of their form of prayer and fome favourite idols. Next nine fumptuary horfes were led loaded with the LAMA's apparel; after which came the priefts immediately attached to the LAMA's perfon for the performance of daily offices in the temple, amounting to about 700; following them were two men each carrying on his fhoulder a large cylindrical gold infignium emboffed with emblematical figures (a gift from the Emperor of *China*). The *Dubunniers* and *Soopoons*, who were employed in communicating addreffes and diftributing alms, immediately preceded the LAMA's bier, which was covered with a gaudy canopy, and borne by eight of the fixteen *Chinefe* appointed for this fervice. On one fide of the bier attended the Regent, on the other the LAMA's father. It was followed by the heads of the different Monafteries, and as the proceffion advanced, the priefts who formed the ftreet fell in the rear and brought up the fuite, which moved at an extremely flow pace, and about noon was received within the confines of the Monaftery amidft an amazing difplay of colours, the acclamations of the croud, folemn mufic, and the chanting of their priefts.

The LAMA being fafely lodged in the palace, the Regent and SOOPOON CHOOMBOO went out, as is a cuftomary compliment paid to vifitors of high rank on their near approach, to meet and conduct DALAI LAMA and the Viceroy of *Laffa* who were on the way to *Teefhoo Loomboo*. Their retinues encountered the following morning at the foot of *Painom* caftle, and the next day together entered the Monaftery of *Teefhoo Loomboo*, in which both DALAI LAMA and the Viceroy were accommodated during their ftay.

The following morning, which was the third after TEESHOO LAMA's arrival, he was carried to the great temple, and about noon feated upon the throne of his progenitors; at which time the Emperor's ambaffador delivered his diploma, and placed the prefents with which he had been charged at the LAMA's feet.

The three next enfuing days, DALAI LAMA met TEESHOO LAMA in the temple, where they were affifted by all the priefts in the invocation and publick worfhip of their Gods. The rights then performed completed, as I underftand, the bufinefs of inauguration. During this interval all who were at the capital were entertained at the publick expence, and alms were diftributed without referve. In conformity likewife to previous notice circulated every where for the fame fpace of time, univerfal rejoicings prevailed throughout *Tibet*. Banners were unfurled on all their fortreffes, the

the peaſantry filled up the day with muſick and feſtivity, and the night was celebrated by general illuminations. A long period was afterwards employed in making preſents and publick entertainments to the newly-inducted LAMA, who at the time of his acceſſion to the Muſnud, or, if I may uſe the term, pontificate, of *Teeſhoo Loomboo*, was not three years of age. The ceremony was begun by DÁLAI LAMA, whoſe offerings are ſaid to have amounted to a greater value, and his publick entertainments to have been more ſplendid, than the reſt. The ſecond day was dedicated to the Viceroy of *Laſſa*. The third to the *Chineſe* General. Then followed the Culloong or Magiſtrates of *Laſſa*, and the reſt of the principal perſons who had accompanied DALAI LAMA. After which the Regent of *Teeſhoo Loomboo*, and all that were dependent on that government, were ſeverally admitted, according to pre-eminence of rank, to pay their tributes of obeiſance and reſpect. As ſoon as the acknowledgements of all thoſe were received who were admiſſible to the privilege, TEESHOO LAMA made, in the ſame order, ſuitable returns to each, and the conſummation laſted forty days.

Many importunities were uſed with DALAI LAMA, to prolong his ſtay at *Teeſhoo Loomboo*, but he excuſed himſelf from encumbering the capital any longer with ſo numerous a concourſe of people as attended on his movements, and deeming it expedient to make his abſence as ſhort as poſſible from the ſeat of his authority, at the expiration of forty days he withdrew with all his ſuite to *Laſſa*, and the Emperor's ambaſſador received his diſmiſſion to return to *China*; and thus terminated this famous feſtival.

With reſpect to the lately-eſtabliſhed commercial intercourſe, POORUNGEER informs me that though ſo early, he found himſelf not the firſt perſon who had arrived at *Teeſhoo Loomboo* from *Bengal*. Many merchants had already brought their commodities to market, and others followed before he left it. He heard from no quarter any complaint of impediment or loſs, and concludes therefore that all adventurers met the ſame eaſy acceſs and ready aid as he himſelf had every where experienced. The markets were well ſtocked with *Engliſh* and *Indian* articles, yet not in ſo great a degree as to lower the value of commodities below the prices of the two or three laſt preceding years. Bullion was ſomewhat reduced in worth in compariſon with the year 1783. A pootree, or bulſe of gold duſt, the ſame quantity that then ſold for twenty-one Indermillees, was procurable of a purer quality for nineteen and twenty Indermillees. A talent of ſilver, which was then 500, was 450 Indermillees; ſo that the exchange was much in favour of the trader.

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POORUNGEER, during his refidence at *Teefhoo Loomboo*, had very frequent interviews with the Regent and the minifters, and affures me he found the heartieft difpofitions in them to encourage the commercial intercourfe eftablifhed under the aufpices of the late Governor General, whofe departure, however, the Regent regretted as the lofs of the firft friend and ally he became connected with, of, I believe it may be faid, any foreign nation; in whom was acknowledged alfo the original means of opening the communication and of commencing a correfpondence between the Governments of *Bengal* and *Tibet*; and although it may be obferved that, in confequence of his having from the beginning been ufed exclufively to addrefs himfelf to, and acknowledge alone the agents of, Mr. HASTINGS, his attachments to the *Englifh* nation had grown not without a great degree of perfonality, yet, free from an unworthy capricioufnefs of temper, he defcended not to take advantage of the opening offered by his friend's departure to clofe the new connection. For fuch was the refpect he had learnt to entertain for our national integrity of character, that, under the apparent conviction our views tended to no fcheme of ambition, but were confined merely to objects of utility and curiofity. POORUNGEER affures me he expreffed an anxious defire for continuing with the fucceeding Governor General the exercife of thofe offices of friendfhip fo long fupported by his predeceffor; and in the hope that his would be met with equal wifhes, determined to invite you to join him in preferving the fame intercourfe of commerce and correfpondence fo effentially calculated for the benefit of both countries. In confequence of which the LAMA and the Regent addreffed the letters POORUNGEER had the honour to deliver to you, tranflations of which having, in obedience to your directions, been applied for to your *Perfian* tranflator, I now fubjoin them.

Copy of a Letter from TEESHOO LAMA.

" God be praifed, that the fituation of thefe countries is in peace and happinefs, " and I am always praying at the altar of the Almighty for your health and prefervation. This is not unknown: you are certainly employed in protecting and affifting " the whole world, and you promote the good and happinefs of mankind. We have " made no deviation from the union and unanimity, which exifted during the time " of the firft of nobles Mr. HASTINGS and the deceafed LAMA, and may you alfo " grant friendfhip to thefe countries, and always make me happy with the news " of your health, which will be the caufe of eafe to my heart and confirmation to " my foul. At this time, as friendly offerings of union and unanimity, I fend one

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" handkerchief, one ketoo of ſilver, and one piece of cochin. Let them be ac-
" cepted."

From the RAJAH *of* Teeſhoo Loomboo.

" God be praiſed, that the ſituation of theſe countries is in peace and happineſs, " and I am always praying at the altar of the Almighty for your health and preſerv- " ation. This is not unknown: I am conſtantly employed in promoting the ad- " vantage of the ſubjects and the ſervice of the newly-ſeated LAMA, becauſe the " newly-ſeated LAMA is not diſtinct from the deceaſed LAMA, and the light of his " countenance is exalted. Grant your friendſhip to POORUNGEER *Goſſeyn.*

" Maintain union and unanimity and affection, like the firſt of nobles, and every " day make me happy with the news of your health and proſperity, and beſtow " favours like the firſt of nobles, and make me happy with letters, which are cauſes " of conſolation. At this time, as friendly offerings of union and affection and una- " nimity, I ſend one handkerchief, three tolah of gold, and one piece of cochin. " Let them be accepted."

POORUNGEER, having received theſe diſpatches in the beginning of October, after a reſidence of five months at *Teeſhoo Loomboo*, took leave of the LAMA and the Regent, and ſet out on his return, by the ſame route he came, to *Bengal*. The weather at this ſeaſon of the year being moſt extremely favourable for travelling, he experienced no delay or interruption in the courſe of his journey through *Tibet* and *Bootan*, but arrived at *Rungpore* early in December, whence he proceeded as expeditiouſly as poſſible to the Preſidency; where, to his great mortification and concern, he finds upon his arrival his affairs involved in great diſtreſs: the little territory, his adopted Chela was left in charge of, having during his abſence been violently invaded by RAJA CHUND, a neighbouring Zemeendar, and to the amount of fifty begas forcibly taken out of his hands. Prevailed on by his earneſt repeated ſolicitations, I am induced to ſay for him, that in your juſtice and favour are his only hopes of relief from his embarraſſments, and he humbly ſupplicates your protection in reſtoring and ſecuring him in the poſſeſſion of his invaded right. The liberty of this interceſſion, I am confident to think, would be forgiven, were it not in favour of one who has rendered to this Government various uſeful ſervices; but as, though of trivial importance, it affords an authentick inſtance of the encroaching diſpoſition of inferior Zemeendars. Yet another circumſtance it may not be improper to point out.

out. The ground alluded to is a part of the land ſituated upon the weſtern bank of the river oppoſite Calcutta, that was formerly granted under a Sunnud of this Government to TEESHOO LAMA, for the foundation of a temple of worſhip, and as a reſort for ſuch pilgrims of their nation, as might occaſionally make viſits to the conſecrated Ganges.

Having, in conformity to your deſires, done my beſt endeavours literally to tranſlate all the information POORUNGEER could give me, I have now only to apologize for the prolixity of the account, which I have been induced to be particularly minute in, as I conceived every circumſtance, however trivial, might be in ſome degree intereſting, that tends to illuſtrate any trait in the national character of a people we are but recently become acquainted with, and with whom in its extended views it has been an object of this Government to obtain a cloſer alliance.

I will not now preſume to intrude longer on your time by adding any obſervations on conjectures deducible from the elevated importance your young ally ſeems riſing to, in conſequence of the ſignal reſpect paid him by the moſt exalted political characters known to his nation; but beg leave to repeat that it is with infinite ſatisfaction, I learn from the reports of POORUNGEER the flouriſhing ſtate of the lately projected ſcheme of trade, to promote which, he aſſures me, not any thing had been wanting in facility of intercourſe: that the adventurers, who had inveſted their property, had experienced perfect ſecurity in conducting their commerce, carried their articles to an exceeding good market, and found the rate of exchange materially in their favour.

Thoſe advantages authorize the inference, that it will no doubt encourage more extenſive enterprize; and permit me to add, I derive a confidence from the ſucceſs of this infant eſſay, that inſpires me with the ſtrongeſt hopes, that the commiſſion which your Honourable Board was pleaſed to commit to my charge, will eventually be productive of eſſential benefits to the political and commercial intereſts of the Company.

I have the honour to be,
Honourable Sir,
With the greateſt reſpect,
Your moſt obedient, faithful,
And moſt humble Servant,
SAMUEL TURNER.

Calcutta, February 8, 1786.

IX.

ON THE GODS OF GREECE, ITALY, AND INDIA.—*See the Works of Sir William Jones, Vol. I. p. 229.*

X.

A DESCRIPTION OF A CAVE NEAR GYA'.

By JOHN HERBERT HARINGTON, *Esq.*

A KNOWLEDGE of the antiquities of *Hindoſtan* forming one of the ſeveral objects propoſed by the inſtitution of our Society, with the hope of communicating ſomething acceptable on this head, I took the opportunity of a late excurſion up the country to ſee the *Cave* which Mr. HODGEKIS a few years ſince attempted to viſit, at the deſire, I believe, of the late Governor General, but was aſſaſſinated in his way to it by the followers of one of the rebellious Allies of CHYT SING. On my deſcribing it to the Preſident, whom I had the pleaſure to accompany, I was encouraged by him to think that a particular account of it would be curious and uſeful; and in conſequence made a ſecond viſit to it from *Gyá*, when I took the following meaſurements, and, by the means of my *Moonſhee*, a copy of the inſcription on it, which I had deſpaired of preſenting to you, but in its original language (a *Pundit* at *Benáris* having attempted in vain to get it read, during theſe laſt three months), till the kind aſſiſtance of Mr. WILKINS enabled me to add the accompanying tranſlation and remarks to what would otherwiſe have given little ſatisfaction.

The Hill, or rather Rock, from which the Cavern is dug, lies about fourteen miles North of the ancient city of *Gyá*, and ſeems to be one of the South Eaſtern Hills of the Chain of mountains called by RENNEL *Caramſhah*, both being a ſhort diſtance to the Weſt of the *Phulgó*.

It is now diſtinguiſhed by the name of *Nágurjenee*; but this may, perhaps, be a modern appellation; no mention of it being made in the inſcription. Its texture is a kind of Granite, called by the MOHUMMEDAN natives *Sung Khárch*, which compoſes the whole Rock, of a moderate height, very craggy and uneven, and ſteep in its aſcent.

The *Cave* is ſituated on the Southern declivity, about two thirds from the ſummit: a tree immediately before it prevents its being ſeen from the bottom. It has only one narrow entrance, from the South, two feet and a half in breadth, ſix feet high, and of thickneſs exactly equal. This leads to a room of an oval form, with a vaulted roof, which I meaſured twice, and found to be forty-four feet in length from Eaſt to Weſt, eighteen feet and a half in breadth, and ten feet and a quarter in height at the centre. This immenſe cavity is dug entirely out of the ſolid rock, and is exceedingly well poliſhed, but without any ornament. The ſame ſtone extends much farther than the excavated part, on each ſide of it, and is altogether, I imagine, full a hundred feet in length. The inhabitants near know nothing of its hiſtory or age, but I learnt from the chief of a neighbouring village, that a tradition is extant of a MOHUMMEDAN, named MINHA'J-U-DEEN, having performed his *Cheeleh*, or forty days devotion, in this Cavern; and that he was cotemporary with MUKHDOOM SHERF-U-DEEN, a venerated *Welee*, who died in *Behár* in the 590th year of the *Hijree*; and he even went ſo far as to aver that he himſelf was deſcended from MINHA'J-U-DEEN, and had records at *Patna* of his family's genealogy to the preſent time. What credit is due to this I will not pretend to ſay, but the room is certainly now frequented by MOHUMMEDANS, and has been for ſome time, as there are the remains of an old moſque cloſe before it, and within, a raiſed terrace, ſuch as the MOHUMMEDAN devotees are uſed to conſtruct for their religious retirement. There are two inſcriptions, one on each ſide of the interior part of the entrance; impreſſions of both which my *Moonſhee* took off in the courſe of three days, with much trouble, and ſufficient accuracy to enable Mr. WILKINS to underſtand and explain the whole of one, though many *Pundits*, I was informed, who had ſeen the original engraving, had attempted in vain to decypher it. The other, which conſiſts of one line only, is unfortunately of a different character, and remains ſtill unintelligible.

The following letter and remarks, which Mr. WILKINS has favoured me with, make it unneceſſary for me to ſay any thing of the contents of the inſcription: I can only regret with him that the date is yet undiſcovered; as what is now but a gratification of curioſity might then have been a valuable clue to the illuſtration of obſcure events in ancient hiſtory. There are, however, ſeveral other *Caves* in the adjoining hills, which I likewiſe viſited, but had not time to take the inſcriptions: and from theſe, I hope, a date will be diſcovered.

Were any other teſtimony beſides the inſcription wanted, to ſhew that theſe

Caves

उन्निद्रस्य सरोरुहस्य सकलामाक्षिप्य शोभं रुचा सावज्ञं महिषासुरस्य शिरसि न्यस्तः क्वणन्नूपुरः

देव्या वः स्थिरभक्तिवादसदृशां युज्यात्फलेनाञ्चित दिश्याद्वञ्छनखांशुजालजटिलः पादः १ दं सं १ दं

आसीद्विष्णुसरद्वयज्ञमहिमा श्रीयाज्ञवर्मान्तिपः पख्यातो विमलेन्दुनिर्मलयशाः क्षात्रस्य धाम्नः १ दं

प्रज्ञानाञ्च यदानविक्रमगुणैर्यो राजकस्याग्रणी र्धृतापिप कृतिस्थयं भविनयाद्क्षान्यसज्ञोटघिं

तस्यादीर्णमहार्णवोपमरणव्यापारलब्धयशः तन्वानः ककुदं मखभुक ककुभांकीर्त्तिभिनेदुपुगः

श्रीमान्वान्तुसुदुज्ञनप्रणयिनमाशाः फलैः पूर पुत्रः कल्पतरोरिवाप्य हिमाशार्द्रलवर्मान्तिपः

तस्यानलमनलकीर्त्तियशसोनलादिवमाख्यया स्मातंनोहितभक्तिभावि धियांशुत्रेणप्रनोम्नन

आसूर्य्यक्षितिचन्द्रतारकमियं पुण्यास्पदं वर्द्धित विन्यस्ताद्भुतविन्ध्यभूधरगुहामाश्रियकासायनी

धौत्राघोमलपङ्कदोषममलैर्महानदैरलमिः याधूतो १ वनप्रियङ्गुबकुलैरामोदितं वायुभिः

कल्पाल्पावधिनन्यमुच्चशिखरैच्छायाहतार्कद्युति ग्राममनन्यभागविभवं रत्यंभवान्यददौ

Caves were religious temples, the remains of three defaced Images near another which I viſited, called *Curram Choſſar*, would be ſufficient proof of it. A third, the name of which I could not learn, has its entrance very curiouſly wrought with Elephants and other ornaments, of which, I hope, in a ſhort time, to preſent a Drawing to the Society.

A LETTER FROM CHARLES WILKINS, ESQ. TO THE SECRETARY.

Dear Sir,

HAVING been ſo fortunate as to make out the whole of the very curious inſcription you were ſo obliging as to lend me, I herewith return it, accompanied by an exact copy, in a reduced ſize, interlined with each correſponding letter in the modern *Dēwnāgăr* character; and alſo a copy of my tranſlation, which is as literal as the idioms would admit it to be.

The character is undoubtedly the moſt ancient of any that have hitherto come under my inſpection. It is not only diſſimilar to that which is now in uſe, but even very materially different from that we find in inſcriptions of eighteen hundred years ago. But though the writing be not modern, the language is pure *Sanſkreet*, written in a long verſe, called *Sārdōōlă-vĕĕkrēērĕĕtă*, and conſiſts of four pauſes of nineteen ſyllables each, in this form:

- - - ◡ ◡ - ◡ - ◡ ◡ ◡ - - - ◡ - - ◡ - I - - - ◡ ◡ - ◡ - ◡ ◡ ◡ - - - ◡ - - ◡ -
- - - ◡ ◡ - ◡ - ◡ ◡ ◡ - - - ◡ - - ◡ - I - - - ◡ ◡ - ◡ - ◡ ◡ ◡ - - - ◡ - - ◡ -

The metre was no ſmall help in decyphering the vowels.

The firſt lines of the firſt verſe allude to the ſtory of *Bhăwānēē*'s killing the evil ſpirit *Măhĕĕſhăsōōr*, who, in the diſguiſe of a Buffalo, as the name imports, had fought with *Eendră*, and his celeſtial bands for a hundred years, defeated him, and uſurped his throne. The ſtory is to be found at large in a little book called *Chandee*. The vanquiſhed ſpirits, being baniſhed the heavens and doomed to wander the earth, after a while aſſemble, with their chief *Eendra* at their head, and reſolve to lay their grievances before *Vĕĕſhnōō* and *Sĕĕv*. Conducted by *Brăhmā*, they repair

into

into the prefence of thofe Deities, who heard their complaints with compaffion; and their anger was fo violent againft *Măhēēſhăsŏŏr*, that a kind of flame iffued from their mouths, and from the mouths of the reft of the principal Gods, of which was formed a Goddefs of inexpreffible beauty with ten arms, and each hand holding a different weapon. This was a transfiguration of *Bhăwănēē* the confort of *Sēēv*, under which fhe is generally called *Dŏŏrgā*. She is fent againft the ufurper. She mounts her lion, the gift of the mountain *Hēēmālăy* (fnowy), and attacks the Monfter, who fhifts his form repeatedly; till at length the Goddefs *planteth her foot upon his head*, and cuts it off with a fingle ftroke of her fword. Immediately the upper part of a human body iffues through the neck of the headlefs Buffalo and aims a ftroke, which being warded off by the lion with his right paw, *Dŏŏrgā* puts an end to the combat by piercing him through the heart with a fpear. I have in my poffeffion a ftatue of the Goddefs with one foot on her lion, and the other on the monfter, in the attitude here laftly defcribed.

The want of a date difappointed my expectations. I had fome hopes that it was contained in the fingle line, which you informed me was taken from another part of the *Cave*; but although I have not yet fucceeded in making out the whole, I have difcovered enough to convince me that it contains nothing but an invocation. If you fhould be fo fortunate as to obtain correct copies of the reft of the infcriptions, that are to be found in the *Caves* of thofe mountains, I make no doubt, but that we fhall meet with fome circumftance or other, that will guide us to a difcovery of their antiquity.

I have the pleafure to fubfcribe myfelf,

Dear Sir,

Your very fincere friend,

And obedient humble Servant,

CHARLES WILKINS.

Calcutta, 17*th March*, 1785.

A TRANSLA-

A TRANSLATION OF A SANSCRIT INSCRIPTION.

WHEN the foot of the Goddefs (1) was, with its tinkling ornaments, planted upon the head of *Măhĕēſhăsŏŏr* (2), all the bloom of the new-blown flower of the fountain (3) was difperfed, with difgrace, by its fuperior beauty. May that foot, radiant with a fringe of refulgent beams iffuing from its pure bright nails, endue you with a fteady and an unexampled devotion, offered up with fruits, and fhew you the way to dignity and wealth!

The illuftrious *Yăgnă Vărmā*, was a Prince whofe greatnefs confifted in free-will offerings. His reputation was as unfullied as the Moon. He was renowned amongft the Martial Tribes; and, although he was, by defcent, by wifdom, courage, charity and other qualities, the fore-leader of the royal line; yet, from the natural humility of his temper, he difturbed not the powerful ocean.

His aufpicious fon, *Sārdŏŏlă Vărmā,* a Prince whofe magnificence flowed, as it were, from the tree of imagination (4), difplayed the enfign of royalty in facrifices, and the world was fubdued by his infinite renown. He gratified the hopes of relations, friends and dependants; and honour was achieved from the deed of death (5) near the uprifing ocean.

By his pious fon, called *Ănăntă Vărmā* becaufe of his infinite renown, the holy abode of us contemplative men, who are always ftudious for his good and employed in his fervice, hath been increafed and rendered famous as long as the earth, the fun and moon, and ftarry heaven, fhall endure; and *Kătyāyănēē* (6) having taken fanctuary, and being placed, in this cavern of the wonderful *Veen'dyă* (7) mountains.

The holy Prince gave unto *Bhăwānēē*, in perpetuity, the village ———— (8) and its hilly lands, by whofe lofty mountain-tops the funny beams are caft in fhade: its filth and impurities are wafhed away by the precious ftores of the

(1) *Bhăwānēē* the wife of *Seev.*
(2) The name of an evil fpirit.
(3) Epithet of the lotus.
(4) In the original *Kălpă-tărŏŏ*, a fabulous tree which yielded every thing that was demanded.
(5) He was probably carried to *Găngă-Sāgăr* to die.
(6) One of the names of *Dŏŏrgă* or *Bŏwānēē.*
(7) The name of the chain of mountains which commences at *Chunar.*
(8) The name, which confifted of two long fyllables, is wanting in the original.

Măhānădā

Măhānădā (1), and it is refreſhed by the breezes from the waving *Prēēyăngōōs* (2) and *Băkōōlăs* (3) of its groves.

XI.

TRANSLATION OF A SANSCRIT INSCRIPTION, COPIED FROM A STONE AT BŎŎD-DHĂ-GĂYĀ, BY MR. WILMOT, 1785.

Tranſlated by CHARLES WILKINS, *Eſq.*

IN the midſt of a wild and dreadful foreſt, flouriſhing with trees of ſweet-ſcented flowers, and abounding in fruits and roots; infeſted with Lions and Tigers; deſtitute of human Society, and frequented by the *Moonees*, reſided *Bŏŏd-dhă*, the Author of Happineſs, and a portion of *Narayan*. This Deity *Hărēē*, who is the Lord *Hărēēſa*, the poſſeſſor of all, appeared in this ocean of natural Beings at the cloſe of the *Devāpără*, and beginning of the *Kălēē Yoog*: he who is omnipreſent and everlaſtingly to be contemplated, the Supreme Being, the Eternal One, the Divinity worthy to be adored by the moſt praiſe-worthy of mankind, appeared here with a portion of his divine nature.

Once upon a time the illuſtrious *Ămără*, renowned amongſt men, coming here, diſcovered the place of the Supreme Being, *Bŏŏd-dhă*, in the great foreſt. The wiſe *Ămără* endeavoured to render the God *Bŏŏd-dhă* propitious by ſuperior ſervice; and he remained in the foreſt for the ſpace of twelve years, feeding upon roots and fruits, and ſleeping upon the bare earth; and he performed the vow of a *Moonee*, and was without tranſgreſſion. He performed acts of ſevere mortification, for he was a man of infinite reſolution, with a compaſſionate heart. One night he had a viſion and heard a voice ſaying: "Name whatever boon thou wanteſt." *Ămără Deva*, having

(1) Probably the river called the *Mahonah* in RENNEL's Map of South *Bahar*.
(2) Probably the *Champa*.
(3) *Moulſeree*.

heard

heard this, was aſtoniſhed, and with due reverence replied, "Firſt, give me a viſi-
"tation, and then grant me ſuch a boon." He had another dream in the night, and the voice ſaid: "How can there be an apparition in the *Kălĕĕ Yoog?* the "ſame reward may be obtained from the ſight of an image, or from the worſhip of "an image, as may be derived from the immediate viſitation of a deity." Having heard this he cauſed an image of the Supreme Spirit *Bŏŏd-dhă* to be made, and he worſhipped it, according to the law, with perfumes, incenſes, and the like; and he thus glorified the name of that Supreme Being, the incarnation of a portion of *Veeſhnoo*; "Reverence be unto thee in the form of *Bŏŏd-dhă!* Reverence be unto "the Lord of the Earth! Reverence be unto thee, an incarnation of the Deity and "the Eternal One! Reverence be unto thee, O God, in the form of the God "of Mercy;—the diſpeller of pain and trouble, the Lord of all things, the Deity "who overcometh the ſins of the *Kălĕĕ Yoog*, the Guardian of the Univerſe, the "Emblem of Mercy towards thoſe who ſerve thee—*ōm!* the poſſeſſor of all things "in vital form! Thou art *Brăhmă*, *Veeſhnoo*, and *Măhéſa!* Thou art Lord of the "Univerſe! Thou art, under the proper form of all things moveable and immove-"able, the poſſeſſor of the whole! and thus I adore thee. Reverence be unto the "beſtower of ſalvation, and *Reſheekéſă*, the ruler of the faculties! Reverence be "unto thee *(Kéſavă)*, the deſtroyer of the evil ſpirit *Keſee!* O *Dāmōrdără*, ſhew "me favour! Thou art he who reſteth upon the face of the milky ocean, and who "lyeth upon the ſerpent *Séſă*, Thou art *Trĕĕvĭĕkrămă* (who at three ſtrides encom-"paſſed the Earth!) I adore thee, who art celebrated by a thouſand names, and "under various forms in the ſhape of *Bŏŏd-dhă* the God of Mercy! Be propitious, "O moſt high God!"

Having thus worſhipped the guardian of mankind, he became like one of the juſt. He joyfully cauſed a holy temple to be built of a wonderful conſtruction, and therein were ſet up the divine foot of *Veeſhnoo* for ever purifier of the ſins of mankind, the images of the *Pāndŏŏs* and of the deſcents of *Veeſhnoo*, and in like manner of *Brăhmă*, and the reſt of the divinities.

This place is renowned; and it is celebrated by the name of *Bŏŏd-dhă-Găyă.* The forefathers of him who ſhall perform the ceremony of the *Sradha* at this place ſhall obtain ſalvation. The great virtue of the *Sradha* performed here, is to be found in the book called *Vāyŏŏ-pŏŏrānă*; an epitome of which hath by me been engraved upon ſtone.

Vĕĕkrămādĕtyă was certainly a king renowned in the world. So in his court there

there were nine learned men, celebrated under the epithet of the *Năvă-ratnānēē* or nine jewels; one of whom was *Ămără Dēvă*, who was the King's Chief Counsellor, a man of great genius and profound learning, and the greateſt favourite of his prince. He, it certainly was, who built the holy temple which deſtroyeth ſin, in a place in *Jamboodweep*, where, the mind being ſteady, it obtains its wiſhes, and in a place where it may obtain ſalvation, reputation, and enjoyment, even in the country of *Bhārătă*, and the province of *Kēēkātă*, where the place of *Bŏŏd-dhă*, purifyer of the ſinful, is renowned. A crime of an hundred fold ſhall undoubtedly be expiated from a ſight thereof, of a thouſand fold from a touch thereof, and of a hundred thouſand fold from worſhipping thereof. But where is the uſe of ſaying ſo much of the great virtues of this place? even the hoſts of heaven worſhip with joyful ſervice both day and night.

That it may be known to learned men, that he verily erected the houſe of *Bŏŏd-dhă*, I have recorded, upon a ſtone, the authority of the place, as a ſelf-evident teſtimony, on Friday, the fourth day of the new moon in the month of *Madhoo*, when in the ſeventh or manſion of *Gănīſă*, and in the year of the *Era* of *Vēēkrămādēētyă* 1005.

XII.

TO

SECRETARY *to the* ASIATICK SOCIETY.

SIR,

BEFORE I left *Calcutta*, a gentleman, with whom I chanced to be diſcourſing of that ſect of people who are diſtinguiſhed from the worſhippers of *Brăhm* and the followers of MAHOMMED by the appellation *Seek*, informed me that there was a conſiderable number of them ſettled in the city of *Patna*, where they had a college for teaching the tenets of their philoſophy. As *Patna* was in my way to *Banaris*, I no ſooner arrived there than I inquired after the college, and I was preſently conducted to it; and I now requeſt you will pleaſe to lay before the Society, the few obſervations and inquiries which a ſingle viſit of about two hours would admit of my making. If, ſuch as they are, they ſhould hereafter be found uſeful either as a clue

clue to guide another in his reſearches in the ſame path, or to add to ſome future account to render it more complete, my end in troubling you to lay it before the Society is fully anſwered.

I have the honour to ſubſcribe myſelf,

Sir,

Your moſt obedient humble Servant,

Banaris, *1ſt March*, 1781. CHARLES WILKINS.

I FOUND the college of the *Seeks*, ſituated in one of the narrow ſtreets of *Patna*, at no very conſiderable diſtance from the Cuſtom-houſe. I was permitted to enter the outward gate, but, as ſoon as I came to the ſteps which led up into the chapel, or publick hall, I was civilly accoſted by two of the ſociety. I aſked them if I might aſcend into the hall: They ſaid it was a place of worſhip open to me and to all men; but, at the ſame time, intimated that I muſt take off my ſhoes. As I conſider this ceremony in the ſame light as uncovering my head upon entering any of our temples dedicated to the Deity, I did not heſitate to comply, and I was then politely conducted into the hall, and ſeated upon a carpet, in the midſt of the aſſembly, which was ſo numerous as almoſt to fill the room. The whole building forms a ſquare of about forty feet, raiſed from the ground about ſix or eight ſteps. The hall is in the center, divided from four other apartments by wooden arches, upon pillars of the ſame materials, all neatly carved. This room is rather longer than it is broad. The floor was covered with a neat carpet, and furniſhed with ſix or ſeven low deſks, on which ſtood as many of the books of their law; and the walls, above the arches, were hung with European looking glaſſes in gold frames, and pictures of *Muſſulman* princes, and *Hindoo* deities. A little room, which, as you enter, is ſituated at the left hand end of the hall, is the chancel, and is furniſhed with an altar covered with a cloth of gold, upon which was laid a round black ſhield over a long broad-ſword, and, on either ſide, a *chowry* of peacocks' feathers, mounted in a ſilver handle. The altar was raiſed a little above the ground, in a declining poſition. Before it ſtood a low kind of throne plated with ſilver; but rather too ſmall to be uſeful; about it were ſeveral ſilver flower pots and roſe-water bottles, and on the left hand ſtood three ſmall *urns* which appeared to be copper, furniſhed with notches to receive the donations of the charitable. There ſtood alſo near the altar, on a low deſk, a great book of a folio ſize, from which ſome por-

 tions

tions are daily read in their divine ſervice. It was covered over with a blue mantle, on which were printed, in ſilver letters, ſome ſelect paſſages of their law.

After I had had a long converſation with two of the congregation, who had politely ſeated themſelves, on each ſide of me, on the carpet, and whom I found very intelligent, notice was given, that it was noon and the hour of divine ſervice. The congregation arranged themſelves upon the carpet, on each ſide of the hall, ſo as to leave a ſpace before the altar from end to end. The great book, deſk, and all, was brought, with ſome little ceremony, from the altar, and placed at the oppoſite extremity of the hall. An old man, with a reverend ſilver beard, kneeled down before the deſk with his face towards the altar; and on one ſide of him ſat a man with a ſmall drum, and two or three with cymbals. The book was now opened, and the old man began to chant to the time of the drum and the cymbals; and, at the concluſion of every verſe, moſt of the congregation joined chorus in a reſponſe, with countenances exhibiting great marks of joy. Their tones were by no means harſh; the time was quick; and I learnt that the ſubject was a hymn in praiſe of the Unity, the Omnipreſence, and the Omnipotence, of the Deity. I was ſingularly delighted with the geſtures of the old man: I never ſaw a countenance ſo expreſſive of infelt joy, whilſt he turned about from one to another, as it were, beſpeaking their aſſents to thoſe truths which his very ſoul ſeemed to be engaged in chanting forth. The hymn being concluded, which conſiſted of about twenty verſes, the whole congregation got up and preſented their faces with joined hands towards the altar, in the attitude of prayer. A young man now ſtood forth; and, with a loud voice and diſtinct accent, ſolemnly pronounced a long prayer or kind of liturgy, at certain periods of which all the people joined in a general reſponſe, ſaying *Wā Gooroo!* They prayed againſt temptation; for grace to do good; for the general good of mankind; and a particular bleſſing to the *Seeks:* and for the ſafety of thoſe who at that time were on their travels. This prayer was followed by a ſhort bleſſing from the old man, and an invitation to the aſſembly to partake of a friendly feaſt. The book was then cloſed and reſtored to its place at the altar, and the people being ſeated as before, two men entered bearing a large iron caldron, called a *curray*, juſt taken from the fire, and placed it in the center of the hall upon a low ſtool. Theſe were followed by others with five or ſix diſhes, ſome of which were of ſilver, and a large pile of leaves ſewed together with fibres in the form of plates. One of theſe plates was given to each of the company without diſtinction, and the diſhes being filled from the caldron, their contents were ſerved out till every one

one had got his ſhare: myſelf was not forgotten; and, as I was reſolved not to give them the ſmalleſt occaſion for offence, I ate up my portion. It was a kind of ſweetmeat, of the conſiſtence of ſoft brown ſugar, compoſed of flour and ſugar mixed up with clarified butter, which is called *Ghee*. Had not the *Ghee* been rancid I ſhould have reliſhed it better. We were next ſerved with a few ſugar plums; and here ended the feaſt and the ceremonies of the day. They told me the religious part of the ceremony was daily repeated five times. I now took my leave, inviting ſome of the principal men amongſt them, who were about to return to their own country through *Banaris*, to pay me a viſit.

In the courſe of the converſation I was engaged in with the two *Seeks* before the ſervice, I was able to gather the following circumſtances. That the founder of their faith was called *Nāneek Sah*, who flouriſhed about four hundred years ago at *Punjab*, and who, before his apoſtaſy, was a *Hindoo* of the *Kſhētry*, or military tribe; and that his body diſappeared as the *Hindoos* and the *Muſſulmans* were diſputing for it; for upon their removing the cloth which covered it, it was gone. That he left behind him a book, compoſed by himſelf, in verſe and the language of *Punjab*, but a character partly of his own invention; which teaches the doctrines of the faith he had eſtabliſhed. That they call this character, in honour of their founder, *Gooroo-Mookhee: from the mouth of the preceptor*; that this book, of which that ſtanding near the altar, and ſeveral others in the hall, were copies, teaches that there is but one God, omnipotent and omnipreſent; filling all ſpace, and pervading all matter; and that he is to be worſhipped and invoked. That there will be a day of retribution, when virtue will be rewarded and vice puniſhed (I forgot to aſk in what manner); that it not only commands univerſal toleration, but forbids diſputes with thoſe of another perſuaſion. That it forbids murder, theft, and ſuch other deeds as are, by the majority of mankind, eſteemed crimes againſt ſociety; and inculcates the practice of all the virtues, but particularly an univerſal philanthropy, and a general hoſpitality to ſtrangers and travellers. This is all my ſhort viſit would permit me to learn of this book. It is a folio volume, containing about four or five hundred pages.

They told me further, that ſome years after this book of *Nāneek Sah* had been promulgated, another made its appearance, now held in almoſt as much eſteem as the former. The name of the author has eſcaped my memory; but they favoured me with an extract from the book itſelf in praiſe of the Deity. The paſſage had ſtruck my ear on my firſt entering the hall, when the ſtudents were

were all engaged in reading. From the ſimilarity of the language to the *Hindoovee*, and many *Shanſcrit* words, I was able to underſtand a good deal of it, and I hope, at ſome future period, to have the honour of laying a tranſlation of it before the Society. They told me I might have copies of both their books, if I would be at the expence of tranſcribing them.

I next inquired why they were called *Seeks*, and they told me it was a word borrowed from one of the commandments of their founder, which ſignifies "*Learn thou*;" and that it was adopted to diſtinguiſh the ſect ſoon after he diſappeared. The word, as is well known, has the ſame import in the *Hindoovee*.

I aſked them what were the ceremonies uſed in admitting a proſelyte. A perſon having ſhewn a ſincere inclination to renounce his former opinions, to any five or more *Seeks* aſſembled together, in any place, as well on the highway as in a houſe of worſhip, they ſend to the firſt ſhop where ſweetmeats are ſold, and procure a ſmall quantity of a particular ſort, which is very common, and as I recollect, they call *Batāſā*, and having diluted it in pure water, they ſprinkle ſome of it on the body, and into the eyes of the convert, whilſt one of the beſt inſtructed repeats to him, in any language with which he is converſant, the chief canons of their faith, exacting from him a ſolemn promiſe to abide by them the reſt of his life. This is the whole of the ceremony. The new convert may then chooſe a *Gooroo*, or preceptor, to teach him the language of their ſcriptures, who firſt gives him the alphabet to learn, and ſo leads him on, by ſlow degrees, until he wants no further inſtruction. They offered to admit me into their ſociety; but I declined the honour; contenting myſelf with the alphabet which they told me to guard as the apple of my eye, as it was a ſacred character. I find it differs but little from the *Dewnagur*: the number, order, and powers, of the letters are exactly the ſame. The language itſelf is a mixture of *Perſian*, *Arabick*, and ſome *Shanſcrit*, grafted upon the provincial dialect of *Punjab*, which is a kind of *Hindoovee*, or, as it is vulgarly called by us, *Moors*.

XIII. AN

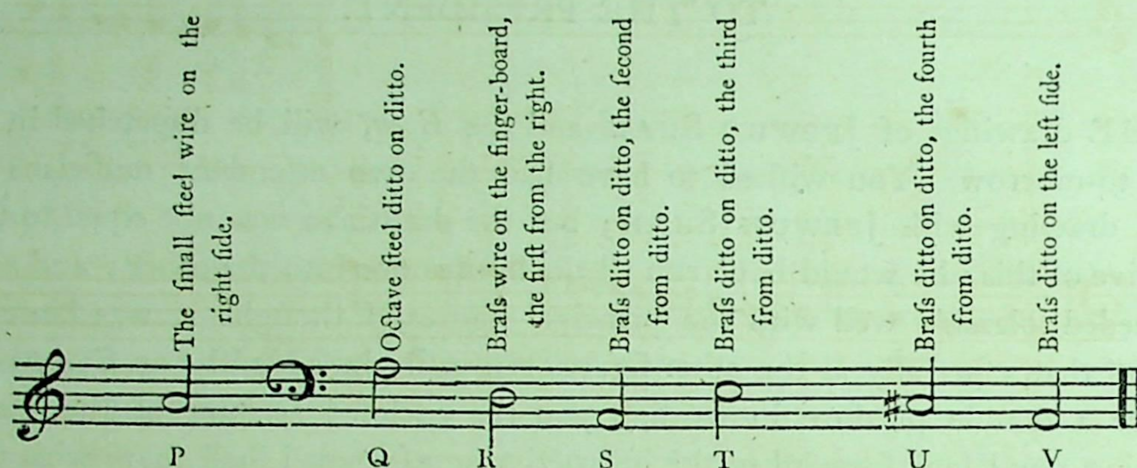
XIII.

AN EXTRACT OF A LETTER FROM FRANCIS FOWKE, ESQ. TO THE PRESIDENT.

THE drawings of JEEWUN SHAH and the *Been*, will be diſpatched in a ſmall boat to-morrow. You wiſhed to have had the two attendant muſicians in the ſame drawing with JEEWUN SHAH; but the draftſman was not equal to the perſpective of this: he would have run all the figures one into the other: and as he has ſucceeded tolerably well with the principal figures, I thought it was better to be ſure of that, eſpecially as the other figures can eaſily be added by an *European* artiſt. I have a double pleaſure in ſending you the encloſed account of the *Been*. In obliging you I look forward to the inſtructive amuſement I ſhall ſhare with the publick at large in the reſult of your reſearches into this ſubject of *Indian* muſick; and I am exceedingly happy by furniſhing you with facts, highly neceſſary indeed, but the mere work of care and obſervation, to give you greater leiſure for the contemplation of the whole. You may abſolutely depend upon the accuracy of all that I have ſaid reſpecting the conſtruction and ſcale of this inſtrument. It has all been done by meaſurement: and with regard to the intervals I would not depend upon my ear, but had the *Been* tuned to the harpſichord, and compared the inſtruments carefully note by note more than once. What I myſelf am aware of will certainly not eſcape your penetration, that there may be a little of the bias of hypotheſis, or an opinion pretty ſtrongly eſtabliſhed in what I have ſaid of the confined modulation of the *Indian* muſick. But it is eaſy to ſeparate my experiments and conjectures, and my prejudices cannot miſlead you, though they may poſſibly ſuggeſt an uſeful hint, as half errors often do.

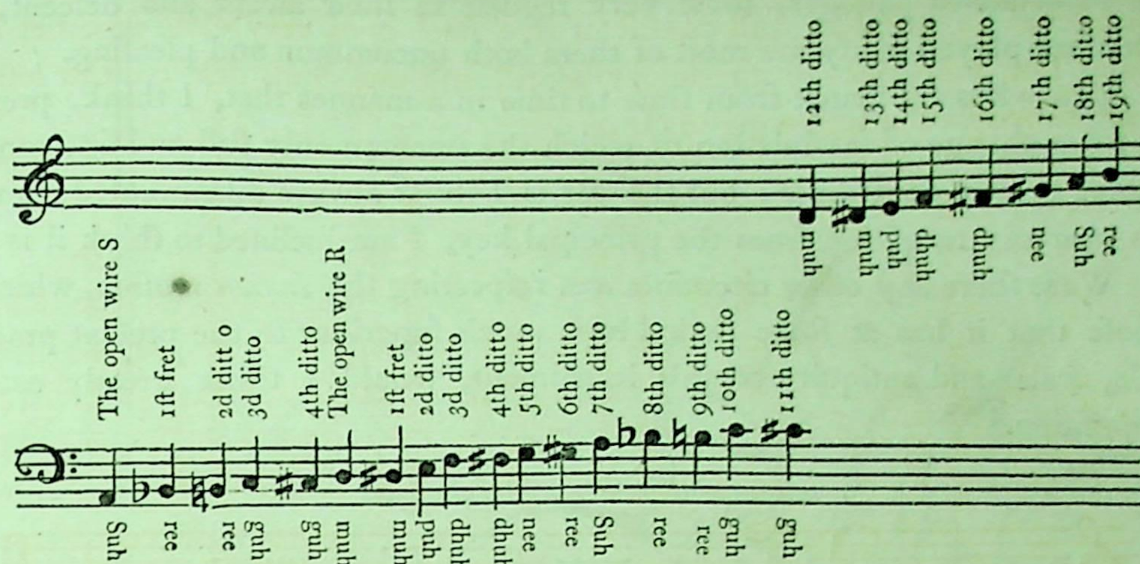
THE *Been* is a fretted inſtrument of the guitar kind. The finger-board is $21\frac{6}{8}$ths inches long. A little beyond each end of the finger-board are two large gourds, and beyond theſe are the pegs and tail-piece which hold the wires. The whole length of the inſtrument is three feet ſeven inches. The firſt gourd is fixed at ten inches from the top, and the ſecond at about two feet $11\frac{1}{2}$. The gourds are very large, about fourteen inches diameter, and have a round piece cut out of the bottom about five inches in diameter. The finger-board is about two inches wide. The wires

wires are ſeven in number, and conſiſt of two ſteel ones very cloſe together in the right ſide, four braſs ones on the finger-board, and one braſs one on the left ſide. They are tuned in the following manner.



The great ſingularity of this inſtrument is the height of the frets ; that neareſt the nut is one inch $\frac{1}{8}$, and that at the other extremity about $\frac{7}{8}$ths of an inch, and the decreaſe is pretty gradual. By this means the finger never touches the finger-board itſelf The frets are fixed on with wax by the performer himſelf, which he does entirely by ear. This was aſſerted by PEAR CAWN, the brother of JEEWUN SHAH, who was ill at the time, but PEAR CAWN is a performer very little, if at all, inferiour to JEEWUN SHAH. The frets of PEAR CAWN's inſtrument were tolerably exact ; any little difference is eaſily corrected by the preſſure of the finger : indeed, the performers are fond, on any note that is at all long, of preſſing the ſtring very hard, and letting it return immediately to its natural tenſion, which produces a ſound ſomething like the cloſe ſhake on the violin, but not with ſo agreeable an effect, for it appears ſometimes to alter the ſound half a tone.

The frets are nineteen in number. The notes that they give will appear on the following ſcale. I have added below the names which the performer himſelf gives to the notes in his own language. It is very obſervable, that the ſemitones change their names on the ſame ſemitone as in the *European* ſcale.



On the wires R and S, which are thoſe principally uſed, there is an extent of two octaves, a whole note with all the half notes, complete in the firſt octave, but the g ♮ and b♭ wanting in the ſecond. The performer's apology for this was that he could eaſily get thoſe notes by preſſing the ſtring a little hard upon the frets f ♯ and a ♮, which is very true from the height of the frets, but he aſſerted that this was no defect in his particular inſtrument but that all *Beens* were made ſo. The wires TU are ſeldom uſed except open.

The *Been* is held over the left ſhoulder, the upper gourd reſting on that ſhoulder, and the lower one on the right knee.

The frets are ſtopped with the left hand, the firſt and ſecond fingers are principally uſed. The little finger of the hand is ſometimes uſed to ſtrike the ncte V. The third finger is ſeldom uſed, the hand ſhifting up and down the finger board with great rapidity. The fingers of the right hand are uſed to ſtrike the ſtrings of this hand, the third finger is never uſed. The two firſt fingers ſtrike the wires on the finger-board, and the little finger ſtrikes the two wires. The two firſt fingers of this hand are defended by a piece of wire put on the tops of them in the manner of a thimble, when the performer plays ſtrong this cauſes a very jarring diſagreeable ſound, whereas when he plays ſoftly the tone of the inſtrument is remarkably pleaſing.

The ſtyle of muſick on this inſtrument is in general that of great execution. I could hardly ever diſcover any regular air or ſubject. The muſick ſeems to conſiſt of a number

number of detached paſſages, ſome very regular in their aſcent and deſcent, and thoſe that are played ſoftly are moſt of them both uncommon and pleaſing.

The open wires are ſtruck from time to time in a manner that, I think, prepares the ear for a change of modulation to which the uncommonly full and fine tones of theſe notes greatly contribute ; but the ear is I think always diſappointed : and, if there is ever any tranſition from the principal key, I am inclined to think it is very ſhort. Were there any other circumſtances reſpecting the *Indian* muſick, which led to ſuppoſe that it has at ſome period been much ſuperiour to the preſent practice, the ſtyle, ſcale, and antiquity of this inſtrument, would I think greatly confirm the ſuppoſition.

XIV.

A DESCRIPTION OF THE MA'HWAH TREE.

By Lieutenant CHARLES HAMILTON.

THERE is a very curious and uſeful tree called by the Natives of *Bahar*, and the neighbouring countries, the *Máhwah* or *Máwee* ; its name, as written by them, being مهوه ; but the *Sanſcrit* name is *Madhúca* or *Madhudruma.*

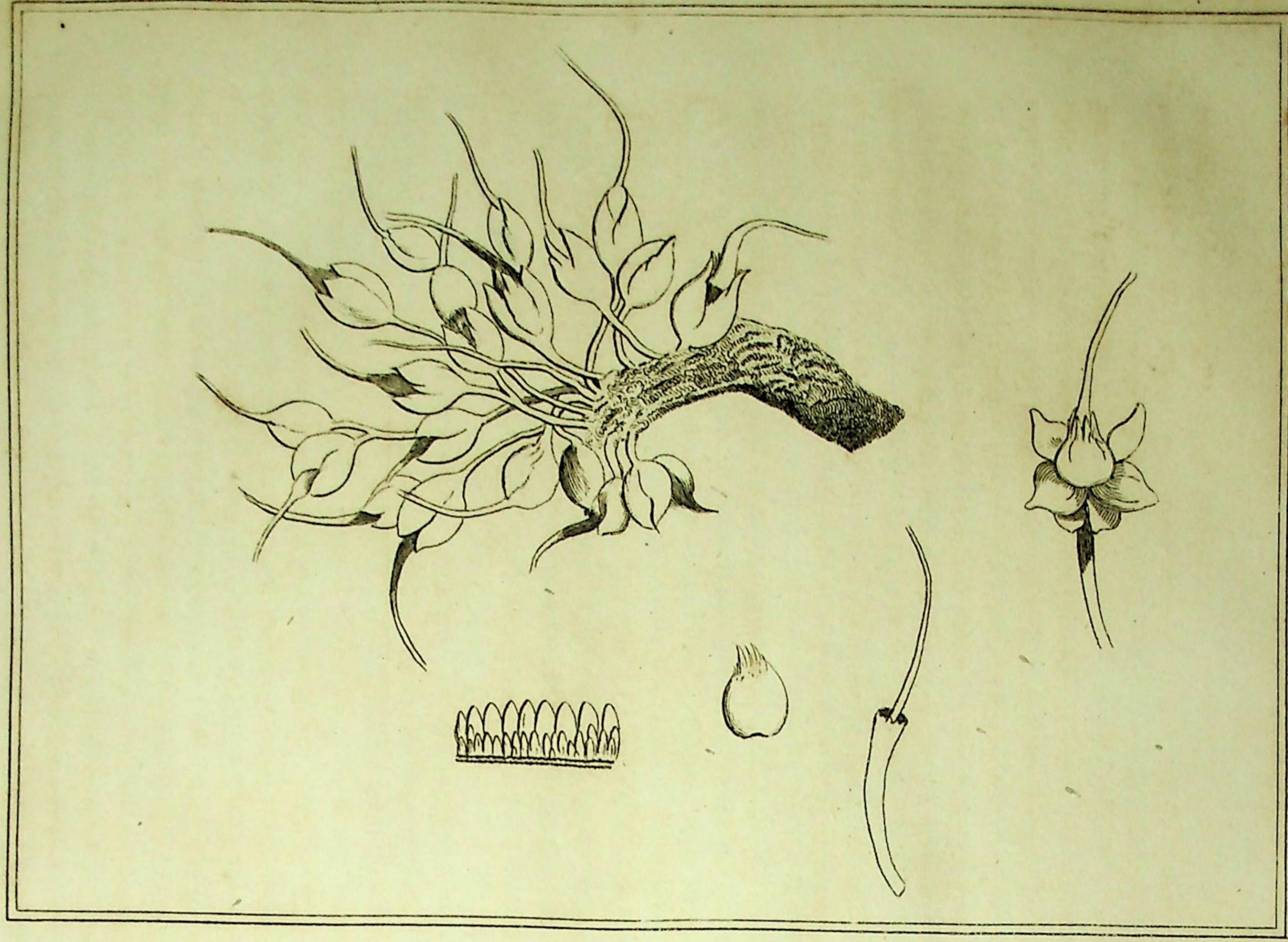
It is of the claſs of the Polyandria monogynia, of Linnæus, but of a genus not deſcribed by him.

The Calix is monophyllous, quadrifid, half divided, and imbricated in its divided part ; the two oppoſite and *outer* covering, in part, the two oppoſite and *inner* parts.

The *Corolla* is monopetalous, having an inflated tube for its lower part, of near an inch long, thick, fleſhy, and of a cream colour : from this ariſe nine ſmall leaves, as it were, like petals from a Calyx, that are imbricated and twiſted, one over the other, from right to left, claſping the lower part of the ſtyle in a point ; by which they ſeem to ſerve, in ſome reſpect, like a forceps, to detach the whole *Corolla* at the ſeaſon of its dropping.

There are no filaments ; but the *Antheræ,* which are in number moſt commonly twenty-ſix, long, ſcabrous, and ſpear-headed, are inſerted in rows, on the inſide and upper part of the tube of the *Corolla*.

The



The Madhúca.

The ſtyle is long, round, and tapering, and projects about an inch beyond the *Corolla*; it is ſucceeded by a drupe, with a thick pericarpium, bilocular, containing two ſeeds or kernels covered with a dark brown ſkin: there are often, however, *three* of theſe, in three ſeparate diviſions.

The flowers riſe in bunches, from the extremities of the ſmaller branches: and have each a pedicle of about an inch and a half long: theſe are moſtly turned downwards, whence the Corollas more eaſily drop off.

The tree, when full grown, is about the ſize of a common *Mango-tree*, with a buſhy head and oval leaves, a little pointed; its roots ſpreading horizontally, are ſunk but little in the earth: the trunk, which is often of a conſiderable thickneſs, riſes ſeldom to any great height, without giving off branches; it is, however, not uncommon, to ſee it ſhoot up clear to the length of eight or ten feet: the wood itſelf is moderately hard, fine grained, and of a reddiſh colour.

By inciſion, the tree affords a reſinous *Gum*, from the bark.

The flowers are of a nature very extraordinary, differing eſſentially from thoſe of any other plant with which I am acquainted, as they have not in any reſpect, the uſual appearance of ſuch, but rather reſemble *berries*, and I, like many others, had long conceived them to be the *fruit* of the *Máhwah*; the tree drops its leaves in the month of February, and early in March theſe flowers begin to come out in cluſters of thirty, forty, or fifty, from the extremity of every ſmall branch; and, from this period till the latter end of April, as the flowers come to maturity (for they never open or expand) they continue falling off, with their *Antheræ*, in the mornings, a little after ſun-riſe, when they are gathered; and afterwards dried by an expoſure of a few days in the ſun: when thus prepared, they very much reſemble a dried *Grape*, both in taſte and flavour.

Immediately after the flowers drop off freſh ſhoots are made for the new leaves, which ſoon make their appearance; coming preſently to their full growth.

The fruit (*properly* ſo called) is of two ſorts in ſhape; the one reſembling a ſmall *Walnut*; the other ſomewhat larger and pointed: it is ripe towards the middle of May, and continues dropping from the tree till the whole fall; which is generally about the beginning or towards the middle of June. The outer covering, or *Pericarpium*, which is of a ſoft texture, commonly burſts in the fall, ſo that the ſeeds are very eaſily ſqueezed out of it: the ſeeds are ſomewhat of the ſhape, but longer than an *Olive*.

Theſe

Theſe ſeeds are replete with a thick *Oil*, of the conſiſtence of *Butter* or *Ghee*, which is obtained by expreſſion.

From this deſcription it may eaſily be conceived that the *Máhwah tree* and its productions are of ſingular and general uſe, eſpecially in thoſe dry and barren countries, which, from the nature of their ſituation, are not ſo well calculated for producing in plenty or perfection the other neceſſaries of life.

The *Corolla* or flowers, after being dried as before deſcribed, are eaten by the natives raw, or dreſſed with their *Curries*; and, when even ſimply boiled with rice, they afford a ſtrengthening and wholeſome nouriſhment. They are, indeed, often applied to a leſs laudable purpoſe; for being fermented, they yield, by diſtillation, a ſtrong ſpirit, which the people here ſell ſo very cheap, that for *one pice* (about a half-penny), may be purchaſed no leſs than a *Cutcha-Seer* (above a pint *Engliſh*), with which any man may get completely drunk. Theſe flowers make an article of trade; being exported from this country to *Patna* and elſewhere, in no inconſiderable quantities.

The *Oil* yielded by the fruit, as before mentioned, reſembles *Ghee* ſo much, that, being cheaper, the natives often mix it with that commodity. They uſe it, the ſame as *Ghee*, in their victuals, and in the compoſition of ſome ſorts of ſweetmeats; and burn it in their lamps: it is alſo regarded as a ſalutary remedy, applied exteriorly, to wounds, and all cutaneous eruptions. It is, at firſt, of the conſiſtence of common *Oil*, but ſoon coagulates; after being kept for ſome time, it acquires a bitteriſh taſte and rancid ſmell, which renders it ſomewhat leſs agreeable, as an article of food: but this is an inconvenience which, by the *Oil* being properly clarified and prepared at firſt, might be perhaps avoided. This *Oil* is alſo exported, both in its adulterated and original ſtate, to *Patna*, and other parts of the low country.

I do not know any purpoſe to which the *Gum* has ever been applied; but if found, upon trial, to be of uſe, it might be collected in large quantities: the beſt ſeaſon for this would be in the months of March and April, about the time the flowers come out, when the tree ſeems to be moſt replete with it; ſuch an operation, indeed, would probably diminiſh its produce in the fruit and flower; but, where it was ſufficiently cultivated, the loſs in thoſe could be but little felt.

The wood, from what has been already ſaid of it, cannot be expected to be often had in beams of any conſiderable length, ſo as to make it ſo very uſeful in building as it would otherwiſe be from its not being liable to be eat by the white ants: Mr. KEIR, however, tells me, that when he was at *Chowſee* (a village upon the *Caramnaſſa*,

naſſa, near *Buxar)*, he had beams of it which were, to the beſt of his remembrance, above twenty feet long: but, in many other reſpects, it is a moſt uſeful wood; and, as it is tough, and of a ſtrong texture, it might perhaps be employed to advantage in ſhip building, in which caſe, if properly cultivated, in many grounds that ſeem well adapted for it, and fit for little elſe, it might thus, in time, become a valuable article in that branch at *Calcutta*, whither it could eaſily be tranſported during the rainy ſeaſon, from almoſt any part of theſe countries, by ſeveral rivers that are then ſufficiently full to float it down.

The tree, I am told, will grow in the moſt barren ground, even amongſt ſtones and gravel, where there is the leaſt appearance of a ſoil; and it ſeems to deſtroy all the ſmaller trees and bruſhwood about it: yet it does not refuſe a *rich* ſoil either; Mr. KEIR having obſerved to me that the few he had ſeen about *Buxar*, where it is certainly very good, were both taller, and ſeemed to thrive much better than any he had ever met with in *Ramgur*. It does not require much *moiſture*, ſeeming to produce nearly at well in the drieſt as in moſt favourable years; and in every ſituation; and is therefore admirably fitted for the convenience of the inhabitants of theſe hilly countries, which are peculiarly ſubject to long and ſevere droughts during the hot months.

Yet, notwithſtanding its utility, and the immenſe quantity of ground that ſeems ſo well adapted to the growth of it, both here, and in the neighbouring provinces of *Catak*, *Pacheet*, *Rotas*, &c. (greateſt part of which, indeed, ſeems fit for no other uſeful production). I have myſelf never obſerved, nor can I find any of my acquaintance who ever have remarked, one ſingle tree in its infant ſtate: we can ſee, every where, *full-grown* trees in great abundance; but, never meeting with any young plants, both I and all whom I have ſpoken to on the ſubject, are at ſome loſs to conceive how they ſhould have come here: neither can the country people themſelves, of whom I have enquired, give any rational account of this: although it appears pretty evident, that numbers of them muſt have been cultivated ſome time or other, every village having many of them growing about it.

This is a circumſtance which ſufficiently marks the true character of the lower order of natives in their moſt ſupine indolence and ſloth; owing chiefly, perhaps, to the ignorant and ſtupid rapacity of their *Rajahs*, *Zimeendars*, and other *Landholders*, and their total inattention to the welfare of thoſe dejected wretches, from whom they derive their conſequence and power: of their baſe indifference to the intereſts of thoſe whom they thus affect to hold beneath their regard many ſtriking inſtances occurred

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curred to me in the courſe of my enquiries upon this very ſubject; and it was not long ago that, aſking ſome queſtions concerning the *Máhwah* of a *Zimeendar* in this neighbourhood, he anſwered that "it was the food of the *poor* people, and "how ſhould *he* know any thing about it!"

It was this ſtrange neglect of the culture of it, and a knowledge of its uſefulneſs, which firſt led me to enquire into the nature of this tree, from which the bulk of the people hereabouts already draw ſuch great benefit; in order to know whether they might not increaſe it without any great trouble to themſelves; and whether thereby the revenue might not alſo be increaſed, and a certain proviſion be made againſt famines, from which the Natives often ſuffer ſeverely in theſe higher diſtricts.

To effect this, it would be neceſſary to give the *Ryots* every poſſible encouragement to raiſe the tree from the ſeeds; but as the torpid apathy of theſe people, whether natural or acquired, will ever prevent their being moved to any exertion by a a proſpect, however alluring, of *diſtant* advantage, I apprehend the only way of bringing this about would be making the planting and raiſing of a certain number of *Máhwahs* (in proportion to the value of the tenure) an article in their *Kabooleeats* or Agreements.

The tree, as has been already obſerved, will grow almoſt any where: it ought to be ſown about the beginning of the rains, either in beds (to be afterwards tranſplanted), or, at about thirty or forty feet diſtance, in the ground deſigned for it. It is ſaid that, in ſeven years, the trees will give flowers and fruit; in ten, they will yield about half their common produce; and that, in twenty years they come to their full growth; after which, if my information be good, they will laſt near one hundred years. This account, I acknowledge, muſt neceſſarily be very vague and uncertain; as I never have met with a ſingle perſon who appeared to have had either opportunity or inclination to obſerve its progreſs: ſuch, however, is what the country people ſay of it.

I am told that a good tree will eaſily give four *puckha Maunds* (about three hundred weight avoirdupois) of dried flowers, which will ſell here for about two *Rupees*; and of ſeeds it will afford about two *Maunds*; and this, of *Oil*, will yield twenty-ſix *ſeers puckha* weight (near 60*lb.*) which, in a year like this, when *Oil* is cheap, will ſell at this place for two *Rupees* more. It is to be obſerved, however, that *every* tree will not give ſo much, neither are the flowers and *Oil* ſo clear in any part of the hills as at *Chitra*; but, allowing only a *half* of this or leſs, to be the product of each tree (though it might be rendered ſtill much greater by the very leaſt

care

care and induſtry in the cultivation of it) within the ſpace of twenty years, a ſu bſiſt-ence might be raiſed to the inhabitants and a conſiderable revenue to the proprietors of the lands, throughout an immenſe tract of country; the greateſt part of which, in its preſent ſtate, is little better than a barren waſte, and cannot pay one ſingle *anna* to the *Zimeendar* or the Government. That ſuch an advantage might be derived from it, may be proved by the moſt moderate calculation; for, ſuppoſing the trees to be ſown at forty feet diſtance from each other, on each *Begah* (about the third of an acre) might ſtand eight trees; and ſuppoſing the product of each tree to be only *half a Rupee*, there would be *four Rupees* of *annual value* on a *Begah* of ground; half of which going to the proprietor; it would thus give a far better rent than the generality of the beſt grounds in theſe parts; and the labourer would have a produce, without any other trouble than that of ſowing the ſeed; and fencing the ground whilſt the trees were young; and that of annually gathering the flowers, and preparing the *Oil*, when they arrive at their proper ſize: and they would probably begin to give a produce within leſs than ten years after the ſowing.

As this tree will yield nearly its uſual quantity of flowers and fruit in ſeaſons when, for want of rain, every other crop fails; if thus cultivated, it would afford the inhabitants a ſure and certain reſource, under the moſt dreadful, and what has hitherto been, to them, the moſt deſtructive, of all calamities, famine. It is well known that the rice and other ſorts of grain which form the chief part of their ſuſtenance, require a conſiderable degree of moiſture to bring them to perfection; an unuſually dry ſeaſon deſtroys the harveſt in thoſe articles, and reduces the *Ryots* in general to the utmoſt miſery; a predicament into which they could hardly fall, even in the ſevereſt dearth of grain, whilſt they had plenty of the flowers and fruit of the *Máhwah* to depend upon.

It may be here not improper to obſerve that Mr. KEIR is now ſowing a few acres with the ſeed of this uſeful tree, and means to fence it; which may, perhaps, in time, tempt others to follow ſo good an example.

Chatra, Ramgur, July 6, 1785.

XV. OF

XV.

OF THE METHOD OF DISTILLING, AS PRACTISED BY THE NATIVES AT CHATRA IN RAMGUR, AND IN THE OTHER PROVINCES, PERHAPS, WITH BUT LITTLE VARIATION.

By ARCHIBALD KEIR, *Efq.*

THE body of the Still they ufe, is a common, large, unglazed, earthen, water Jar, nearly globular, of about twenty-five inches diameter at the wideft part of it, and twenty-two inches deep to the neck, which neck rifes two inches more, and is eleven inches wide in the opening. Such, at leaft, was the fize of the one I meafured; which they filled about a half with fomented *Máhwah-flowers*, that fwam in the liquor to be diftilled.

The Jar they placed in a Furnace, not the moft artificial, though feemingly not ill adapted to give a great heat with but a very little fuel. This they made by digging a round hole in the ground, about twenty inches wide, and full three feet deep; cutting an opening in the front, floping down to the bottom, on the fides perpendicular, of about nine inches wide, and fifteen long, reckoning from the circle where the Jar was to come, to ferve to throw in the wood at, and for a paffage to the air. On the fide too, they cut another fmall opening, of about four inches by three, the Jar, when placed, forming one fide of it, to ferve as a Chimney for the fmoke to go out at. The bottom of the earth was rounded up like a cup. Having then placed the Jar in this, as far as it would go down, they covered it above, all round, with clay, except at the two openings, till within about a fifth of its heighth; when their furnace was completed.

In this way, I reckon, there was a full third of the furface of the body of the Still or Jar, expofed to the flame, when the fire came to be lighted; and its bottom, not reaching to within two feet of where the fuel was, left a capacious hollow between them, whence the wood, that was fhort and dry, when lighted, being moftly converted into flame, and circulating on fo great a furface of the Still, gave a much ftronger heat than could elfe have been produced from fo very little fuel; a confideration well worth the attention of a manufacturer, in our country more efpecially, where firing is fo dear. There indeed, and particularly as coal is ufed, it

it would be better, no doubt, to have a grate; and that the air ſhould enter from below. As to the benefit reſulting from the body of the Still being of earthen ware, I am not quite ſo clear in it. Yet, as lighter ſubſtances are well known to tranſmit heat more gradually and ſlowly, than the more ſolid, ſuch as metals; may not earthen veſſels, on this account, be leſs apt to burn their contents, ſo as to communicate an empyreumatick taſte and ſmell to the liquor that is diſtilled, ſo often, and ſo juſtly complained of, with us. At any rate, in this country, where pots are made ſo cheap, I ſhould think them greatly preferable, as, at leaſt, much leſs expenſive than thoſe which the Gentlemen, engaged in this manufacture, moſt commonly employ: though of this they are beſt able to judge.

Having thus made their Furnace, and placed the body of the Still in it, as above deſcribed, they to this luted on, with moiſtened clay, to its neck at the opening, what they here call an *Adkur*; forming with it, at once, a cover for the body of the Still, with a ſuitable perforation in it to let the vapour riſe through; and the under part of the Alembick. The *Adkur* was made with two earthen pans, having round holes in their middles, of about four inches diameter; and, their bottoms being turned oppoſite the one to the other, they were cemented together with clay; forming a neck of junction thus, of about three inches, with the ſmall riſing on the upper pan. The lowermoſt of theſe was more ſhallow, and about eleven inches wide, ſo as to cover exactly the opening at the neck of the Jar, to which they luted it on with clay. The upper and oppoſite of theſe was about four inches deep, and fourteen inches wide, with a ledge round its perforation in the middle, riſing, as is already ſaid, from the inner ſide of the neck, of about half an inch high, by which a gutter was formed to collect the condenſed ſpirit as it fell down; and from this there was a hole in the pan to let it run off by; to which hole they occaſionally luted on a ſmall hollow *Bamboo*, of about two feet and a half in length, to convey it to the receiver below. The upper pan had alſo another hole in it, of about an inch ſquare, at near a quarter of its circumference from the one below juſt ſpoken of, that ſerved to let off the water employed in cooling; as ſhall be mentioned preſently.

Their *Adkur* being thus fitted to the Jar, they completed the Alembick by taking a copper pot, ſuch as we uſe in our kitchens, of about five inches deep, eight wide at the mouth, and ten at the bottom, which was rather flattiſh; and turning its mouth downward, over the opening in the *Adkur*, luted it down on the inſide of the Jar with clay.

For

For their cooler they raiſed a ſeat, cloſe upon, and at the back part of the furnace, about a foot higher than the bottom of the copper-pot; on this they placed a two or three gallon pot, with a round hole, of about half an inch in the ſide of it; and to this hole, before they lighted their fire, they luted on a ſhort tube of a like bore; placing the pot, and directing its ſpout ſo as that, when filled with water, it threw a conſtant and uniform ſtream of it, from about a foot high, or near the center of the bottom of the copper-pot; where it was diffuſed pretty completely over its whole ſurface; and the water falling down into the upper part of the pan of the *Adkur*, it thence was conveyed through the ſquare hole already mentioned, by a trough luted on to it for that purpoſe, to a cooling reſervoir a few feet from the furnace; from which they took it up again to ſupply the upper pot as occaſion required.

As their ſtock of water, however, in this ſort of circulation, was much ſmaller than it ſeemingly ought to have been, being ſcarcely more than ſix or eight gallons, it too ſoon became hot; yet in ſpite of this diſadvantage, that ſo eaſily might have been remedied, and the ſhortneſs of the conducting tube, which had nothing but the common air to cool it, there ran a ſtream of liquor from the Still; and but very little vapour riſing from it; beyond any thing I had ever ſeen from ſtills of a much larger ſize, fitted with a worm and cooler. In about three hours' time, indeed, from their lighting of the fire, they drew off full fifteen bottles of ſpirit; which is more, by a great deal, I believe, than could have been done in our way from a Still of twice the dimenſions.

The conveniences of a worm and cooler, which are no ſmall expence either, I have myſelf often experienced; and if theſe could be avoided in ſo ſimple a way, that might eaſily be improved, the hints that are here offered may be of ſome uſe. The thin metal head is certainly well adapted, I think, to tranſmit the heat to the water, which is conſtantly renewed; and which, if cold, as it ought to be, muſt abſorb the faſteſt poſſible: whereas, in our way, the water being confined in a tub, that, from the nature of its porous ſubſtance, in a great degree rather retains than lets the heats paſs away, it ſoon accumulates in it, and becomes very hot, and though renewed pretty often, never anſwers the purpoſe of cooling the vapour in the worm, ſo expeditiouſly, and effectually, as is done by their more ſimple and leſs expenſive apparatus. In this country more eſpecially, where labour and earthen wares are ſo cheap, for as many *rupees* and leſs, twenty furnaces with ſtills and every thing belonging to them, independent of the copper pots, might very well be erected, that would yield above a hundred gallons of ſpirits a day; allowing each ſtill

ftill to be worked only twice: fo very cheap, indeed, is arrack here, to the great comfort of my miners, and of many thoughtlefs people befide, that for one fingle *peyfa*, not two farthings fterling, they can get a whole *Cutcha-feer* of it in the *Bazar*, or above a full *Englifh* pint, and enough to make them completely intoxicated; objects often painful to be feen.

Of the fuperiour excellence of metal in giving out heat from itfelf, and from vapour contained in it, we have a very clear proof, in what is daily performed on the cylinder of the fteam engine: for cold water being thrown on it when loaded, the contained vapour is conftantly condenfed; whence, on a vacuum being thus formed, and the weight of the atmofphere acting on the furface of the pifton, attached to the arm of the balance, it is made to defcend, and to raife the other arm that is fixed to the pump; while this being fomewhat heavier, immediately finks again, which carries up the pifton, while the cylinder is again filled: and thus alternately by cooling and filling it, is the machine kept in motion: the power exerted in raifing the pump arm being always in proportion to the diameter of the cylinder, or to the furface of the pifton, which is exactly fitted to it, and on which the preffure acts.

The contrivance too, of having the under part of the Alembick, where the condenfed vapour is collected, or upper part of what they call the *Adkur*, of earthen ware, of fo great a thicknefs, and of courfe at fo great a diftance from the heat in the body of the ftill, is well imagined to keep the fpirits the cooleft poffible when collected and running off.

By thus cooling and condenfing the vapour likewife fo fuddenly as it rifes, there is in a great meafure a conftant vacuum made, or as much as poffible can be, but, that both fteam rifes fafter, and that water boils with much lefs heat, when the preffure is taken away from its furface, is an axiom in Chymiftry too well known to need any illuftration: it boiling in vacuum, when the heat is only ninety or ninety-five by Fahrenheit's thermometer, whereas in the open air, under the preffure of the atmofphere, it requires no lefs than that of two hundred and twelve, ere it can be brought to the boiling point.

I muft further obferve, that the fuperiour excellence of condenfing the vapour fo effectually and fpeedily in the Alembick to our method of doing it on a worm and cooler, is greatly on the fide of the former; both from the reafons I have already adduced, and becaufe of the fmall ftream of vapour that can be only forced into the worm, where it is condenfed gradually as it defcends: but above all, from the

X nature

nature of vapour itſelf, with reſpect to the heat contained in it, which of late has been proved by the very ingenious Doctor BLACK to be greater by far than, before his diſcoveries, was imagined. For vapour he has ſhewn to be in the ſtate of a new fluid, where water is diſſolved by heat; with the aſſiſtance perhaps, if I may be allowed a conjecture, of the air which it contains: and all fluids, as he has clearly demonſtated, on their becoming ſuch, abſorb a certain quantity of heat, which becomes what he very properly calls latent heat, it being heat not appearing either to the ſenſes or to the thermometer, while they remain in that liquid ſtate; but ſhowing itſelf immediately by its effects on whatever is near it, upon their changing their form from fluid to ſolid; as on water becoming ice, or metals fixing, and the like. In the ſolution of Salts alſo, there is an abſorption of heat, as we daily experience in the cooling of our liquors by diſſolving Salt-petre in water; and this he has found to be the caſe with water itſelf, and other fluids, when paſſing into a ſtate of vapour by boiling. From the moſt accurate and judicious experiments, indeed, he infers, and with the greateſt appearance of truth, that the heat thus concealed in vapour raiſed by boiling, from any given bulk of water, would be fully ſufficient, if collected in a piece of iron of the like ſize, to make it perfectly red hot. What then muſt be the effect of ſo much heat, communicated in our way of diſtilling to the worm, and to the water in the tub, will be ſufficiently evident from what has been ſaid to prove, I think, that we have hitherto employed a worſe and more defective method than we might have done with reſpect to cooling at leaſt, both in making of ſpirits, and in other diſtillations of the like kind, where a ſimilar mode is adopted.

The poor ignorant *Indian* indeed, while he with wonder ſurveys the vaſt apparatus of *European* diſtillers, in their immenſe large ſtills, worms, tubs, and expenſive furnaces, and finds that ſpirits thus made by them are more valued, and ſell much dearer than his own, may very naturally conclude, and will have his competitors join with him in opinion, that this muſt alone ſurely be owing to their better and more judicious manner of diſtilling with all thoſe ingenious and expenſive contrivances, which he can no wiſe emulate, but in this it would appear, they are both equally miſtaken; imputing the effects, which need not be controverted perhaps, to a cauſe from which they by no means proceed: the ſuperiority of their ſpirits, not at all ariſing from the ſuperiour excellence of theſe ſtills and furnaces, nor from their better mode of conducting the diſtillation in any reſpect; but chiefly rather from their greater ſkill and care in the right choice, and proper management, of

of the materials they employ in fermentation ; and above all, as I apprehend, from the vaſt convenience they have in caſks, by which, and from their abilities in point of ſtock, they are enabled, and do in fact in general keep their ſpirits for a certain time, whence they are mellowed, and improved ſurprizingly both in taſte and ſalubrity.

With reſpect to the latter improvement, I mention it more particularly here, and the more willingly alſo, as in general it ſeems to have been but too little attended to where a due attention to it might be of the greateſt uſe. For of all things that have been found grateful to the human palate, there was none ever uſed I believe, more hurtful to the body, and to the nerves eſpecially, than freſh-drawn ardent ſpirits: and this owing evidently to the principle of inflammability, of which with water they are moſtly made up, being then, in a more looſe and detached ſtate, leſs aſſimilated with the other principles than it afterwards becomes with time. By time, indeed, it is gradually not only more aſſimilated, but at length changes its nature altogether; ſo as to become, what was at firſt ſo pernicious, a benign, cooling liquor: when the ſpirit is ſtrong, the change it is true goes on more ſlow and imperceptibly; yet as a partial alteration is only wanted to mellow it for uſe, a few years keeping would be ſufficient to anſwer the purpoſe here: and whether or no it could be poſſible to prevent any other from being ſold, than that which had been kept a certain time, is well worth the conſideration of the legiſlature.

That the great noxious quality of freſh-drawn ſpirits, is chiefly owing to the cauſe I have aſſigned, a little attention, and comparing of the effects that are uniformly produced by the principle of inflammability, wherever it is met with in a looſe and weakly combined ſtate, as it is in them, will eaſily convince us of: whereas, when fully aſſimilated either in ſpirits, or with any other body, it becomes entirely inert, and uſeful, more or leſs, either for food or phyſick, according to what it happens to be united with. Thus we find it in putrid animal ſubſtances, where it lately formed part of a healthy body, being now detached, or but weakly united with air, exhibiting a moſt offenſive, and pernicious poiſon: though this abſorbed again by a living plant is preſently changed into good and wholeſome nouriſhment; to the vegetable immediately, and to any animal who may afterwards chooſe to eat it. In like manner ſulphur, which is a compound of this principle alone, united to a pure acid, the moſt deſtructive to all animal and vegetable ſubſtances, yet, it being here perfectly inert alſo, may be taken into the body with ſafety: when, if looſened either by heat or by an alkaline ſalt uniting with the acid,

acid, its noxious quality is prefently made perceivable to whoever comes within its reach.

Many other inftances of a like nature might eafily be added, and fome too more appofite perhaps than thofe I have here mentioned; but every one's own experience, with what I have already faid, will fufficiently evince the propriety, and utility of putting an entire ftop, if poffible, to the fale of what ought to be fo juftly prohibited; and this in its confequences, may even help to lead to other more effectual means of correcting, in a great meafure, the cruel abufe of fpirits in general, that has been long fo loudly and fo juftly complained of, amongft the foldiers, lower *Europeans*, and our fervants in this country; where the very worft and indeed poifonous fort of them, is daily fold at fo very cheap a rate.

All I need further add with refpect to diftillation, and on the fuperiour advantages in the mode of conducting it here to that we have been in ufe to employ, for the raifing of fpirits, fimple waters, and the like, is only to obferve, I have no fort of doubt but that the intelligent chymical operators at home, if ever they fhould get a hint of it, will make no manner of fcruple to ufe it alfo, and to improve upon it greatly by a few ingenious contrivances, which their knowledge and experience will fo eafily fuggeft. The principles on which it feems founded indeed, efpecially with regard to their way of cooling, are fo ftriking and juft, that in many other diftillations befides thofe of fpirits and waters, they may be employed, I apprehend, with very great profit, and advantage. I fhall now however confine myfelf to mention only the benefit that may refult from a like procefs in the raifing of the finer aromaticks, while the heat contrived, as in our way, befides impeding the diftillation, muft from its long action on fuch fubtile bodies, probably injure them greatly in the effential quality on which their excellence depends; and upon this very account I am apt to imagine that the greater quantity obtained, and the fuperior quality of the *oil* of *rofes* made in this country, to that made from *rofes* with us, is owing chiefly, if not entirely, to their better and more judicious manner of extracting it here. For, with us, the ftill, being made of metal, may in the firft inftance, impart too great and too fudden a degree of heat, and next, the *oil* continuing fo long in the vapour, and that much compreffed, may, in fo delicate a fubject, not only entirely almoft unite it with the water, fo as to render the feparation impracticable, but may at the fame time alter its effence, fo completely, as that it can no longer appear in the ftate it otherwife might have been found in, had the operation been better conducted, or in the way they do here. A very few trials however

ever would much better certify this than all I can poſſibly ſay on the ſubject, or in fact than all the reaſoning in the world. Therefore as to my own particular opinion of the flavour and quality of the *roſes* at home being equal if not ſuperiour to that of thoſe in this country, I may be entirely ſilent. The rules and reaſoning in chymiſtry, though ſerving greatly to enlarge and improve our underſtanding, being what of themſelves can never be depended upon till confirmed by facts and experiments; where many things often turn out very different, from what, from our beſt and moſt plauſible arguments, we had the greateſt reaſon to expect. Or, if it ſhould be found to be really true, what I have often heard aſſerted, by thoſe however who had it only from others, but not of their own particular knowledge, that, in diſtilling their *oil* of *roſes* at the places where they make it the beſt, they uſe alſo, with their *roſes*, *ſandal-wood*, and ſome other aromaticks, no *roſes*, whatſoever, it is plain, could ever of themſelves be made to afford a like *oil*; nor without ſuch an addition as they employ. A circumſtance, by the bye, that might poſſibly eaſily be certified by ſome one of the many ingenious correſpondents of the ſociety, who may happen to reſide where it is made: and a knowledge of the real truth of it would certainly be of uſe.

Chatra, *December* 24, 1786.

XVI.

A METHOD OF CALCULATING THE MOON'S PARALLAXES, IN LATITUDE AND LONGITUDE.

By Mr. REUBEN BURROW.

IN the Nautical Almanack for 1781, among other problems publiſhed by authority of the Board of Longitude, there is one for calculating the place of the nonageſimal degree; which is expreſsly recommended to aſtronomers as "ſuperior to all other methods for calculating eclipſes of the ſun and occultations of the ſtars:" now as a conſiderable part of that method is erroneous, and particularly in ſouth latitudes, and between the tropicks (which include the moſt of *India)* the error may therefore be

be of confequence, and the more fo as it is publifhed under the fanction of Doctor MASKELYNE, the Aftronomer Royal: I have therefore taken the liberty of giving the following rule to fupply its place, and in imitation of the methods of the *Hindoos*, have endeavoured to exprefs it fo plainly, that any perfon may calculate by it, without knowing much of the fubject.

PROBLEM.

Given the apparent time at any given place; to find the longitude and altitude of the nonagefimal degree, and alfo the parallaxes in latitude and longitude.

1. Turn the difference of longitude from *Greenwich* into time, and add it to the apparent time, if the place be to the weft of *Greenwich*; but fubtract if the place be to the eaft, and the fum, or remainder, will be the apparent time at *Greenwich.*

2. To this time calculate the fun's right afcenfion in time, and add it to the apparent time at the given place; the fum is the right afcenfion of the meridian in time.

3. From the latitude of the place by obfervation fubtract the correction taken from page LXXV of MAYER's Tables; the remainder is the latitude in the fpheroid.

4. Call the right afcenfion of the meridian in degrees AR; and, if the right afcenfion of the meridian

Be between		then in north latitude,		is an arc A	but in fouth latitude,		is the arc A.
	0° and 90°		AR + 90°			90° — AR	
	90 and 270		270 — AR			AR — 90	
	270 and 360		AR — 270			450 — AR	

5. Let half the fum of the colatitude of the place and the obliquity of the ecliptick be called C; and half their difference D; then add the fecant of C, the cofine of D, and the cotangent of half A, together; the fum (rejecting twice radius) is the tangent of an arc M; then add the cofecant of C, the fine of D, and the cotangent of half A, together; the fum (rejecting twice radius) is the tangent of an arc N: then if the colatitude of the place be greater than the obliquity of the ecliptic, the fum of M and N is an angle, whofe complement call B; but, if the colatitude be lefs than the obliquity, let the complement of the difference of M and N be called B.

6. Add the fecant of B, the fine of A, and the cofine of the latitude of the place, together; the fum (rejecting twice radius) is the fine of the altitude of the nonagefimal degree.

7. Add

7. Add the tangent of the latitude to the tangent of the obliquity of the ecliptick; the ſum is the ſine of an angle, which call X.

8. When the right aſcenſion of the meridian is

Between	in N. lat.	or between	in S. lat.	then	is the longitude
360° — X and 90°		X and 90		B	
90 and 180 + X		90 and 180 — X		180 — B	
180 + X and 270		180—X and 270		180 + B	
270 and 360 — X		270 and X		360 — B	

of the nonageſimal degree.

9. Add the moon's latitude to 90° when it is of a contrary name to the latitude of the place; but ſubtract it from 90° when it is of the ſame name; the ſum or remainder, is the moon's polar diſtance: alſo take the difference between the moon's longitude and the longitude of the nonageſimal degree; which difference call P: alſo let half the ſum of the moon's polar diſtance and altitude of the nonageſimal degree, be called Q; and half their difference, R.

10. Add the ſecant of Q, the coſine of R, and the cotangent of half P, together; the ſum is the tangent of an arc *m*; alſo add the coſecant of Q, the ſine of R, and the cotangent of half P together; the ſum is the tangent of an arc *n*.

11. If the altitude of the nonageſimal degree be greater than the moon's polar diſtance, take the ſum of the arcs *m* and *n* for the parallactick angle; but if it be leſs, take their difference.

12. Add the coſecant of the parallactick angle, the ſine of P, and the ſine of the altitude of the nonageſimal degree, together; the ſum (rejecting twice radius) is the ſine of the moon's true zenith diſtance.

13. To the ſine of the moon's true zenith diſtance add the logarithm of the horizontal parallax; the ſum (rejecting radius) is the logarithm of the parallax in altitude nearly; add the parallax, thus found, to the true zenith diſtance, and the ſum will be the corrected zenith diſtance.

14. Add the ſine of the corrected zenith diſtance, the coſine of the parallactick angle, and the logarithm of the horizontal parallax, together; the ſum (rejecting twice radius) is the logarithm of the parallax in latitude.

15. Add the logarithm of the parallax in latitude, the tangent of the parallactick angle, and the ſecant of the moon's latitude, together; the ſum (rejecting twice radius) is the logarithm of the parallax in longitude.

EXAMPLE.

"What is the altitude and longitude of the nonageſimal degree at Ludlow, whoſe lat.

lat. is 52° 23′ north, and longitude 0h. 11m. weſt of *Greenwich*, 7th February, 1778, at 10h. 56′. 11″ app. time, being the time of an occultation of μ geminorum ?"

Not having the Almanack for 1778, I ſhall aſſume the moon's latitude to be 0°. 51′ S. and her longitude 91°. 57′.

h	′	″		h	′	″	
10	56	11	app. time	21	27	14	☉ AR
0	11	0	diff. long.	10	56	11	
11	7	11	app. t. *Greenwich*.	8	23	25	AR of meridian.

°	′	
125	51	15 = AR
270		
144	8	45 = A

°	′	
52	23	latitude.
0	14	correction.
52	9	reduced lat.
37	51	colat.
18	55	half colat.
11	44	half obliq.

Tang. of latitude	10.11319
Tang. of obliquity	9.63761
Sine of 34°.18′=X	9.75080

C =	30 39	ſecant	10.06535	coſecant	10.29261
D =	7 11	coſine	9.99658	ſine	9.09706
½A =	72 4	cotang.	9.51005	cotang.	9.51005
M =	20 28	tang. M.	9.57198	tang. N.	8.89972
N =	4 32				

	°	′	
	25	0	
B =	65	0	
	180	0	
	115	0	long. nonageſimal degree.

A=144.9		ſin.	9.76765
Lat.	52.9	coſ.	9.78788
B	65.0	ſec.	10.37405
Altitude of do.	58 15 S.		9.92958

	°	′
half ☾'s polar diſt. =	45	26
half alt. non. deg. =	29	8

Q =	74 34	ſecant	10.57493	coſecant	10.01595
R =	16 18	coſine	9.98218	ſine	9.44819
½P =	11 32	cotang.	10.69025	cotang.	10.69025
m =	86 46	tang. *m*.	11.24736	tang. *n*.	10.15439
n =	54 58				

Parallactick

Parallactick angle =	31 48	cosecant	10.27823
Alt. non. degree	58 15 -	sine	9.92958
P =	23 3 -	sine	9.59277
Moon's true zen. d.	39 11 -	sine	9.80058
Horizon. parallax	3488 -	log.	3.54258
Par. in alt. nearly	2204 -	log.	3.34316
Corrected zen. dist.	39 47 44	sine	9.80628
Hor. par.		log.	3.54258
Parallactick angle		cosine	9.92936
Parallax in latitude	=1898	log.	3.27822
Parallactick angle	- -	tangent	9.79241
Moon's latitude	- 0 51	secant	10.00023
Parallax in long.	1177 -	log.	3.07086

When the moon is very near the ecliptick as in eclipses, the following method will be nearly exact.

1. Add the cosine of the altitude of the nonagesimal degree to the logarithm of the horizontal parallax; the sum (rejecting radius) is the logarithm of the parallax of latitude nearly: Add this parallax to the complement of the altitude of the nonagesimal degree, and call the sum the complement of the altitude of the nonagesimal degree corrected.

2. Add the cosecant of the complement of the altitude of the nonagesimal degree; the sine of the complement of the altitude of the nonagesimal degree corrected, and the logarithm of the parallax of latitude nearly, together; the sum (rejecting twice radius) is the logarithm of the parallax in latitude corrected.

3. Add the logarithm of the parallax in latitude corrected; the sine of P, and the tangent of the altitude of the nonagesimal degree, together; the sum (rejecting twice radius) is the logarithm of the parallax in longitude.

Scholium. The method of applying the parallaxes usually given requires no other correction than the following: When the pole of the ecliptick of the same name as the latitude is under the horizon, to the cotangent of the altitude of the nonagesimal degree add the cotangent of the moon's latitude; the sum is the cosine

 of

of an angle; which added to, and ſubtracted from, the longitude of nonageſimal degree gives two longitudes, between which the Moon's latitude of a contrary name to the elevated pole is to be increaſed for the apparent latitude; but beyond thoſe longitudes the Moon's true latitude is to be increaſed by the parallax in latitude to have the apparent latitude.

REMARKS ON THE ARTIFICIAL HORIZONS, &c.

By Mr. REUBEN BURROW.

THE utility of a perfect horizon and the liableneſs of Quickſilver to be diſturbed by the leaſt wind, have induced numbers of people to invent artificial horizons of different kinds, and many of them very complicated. Some time ago having occaſion to determine the ſituation of ſeveral places by Aſtronomical Obſervations, and there being no Aſtronomical Quadrant belonging to the Company in the Settlement, I was under a neceſſity of determining the Latitudes by a Sextant; and that at a time when the Sun paſſed ſo near the Zenith as to make it impoſſible to get meridian altitudes: I therefore collected all the different artificial horizons and glaſs roofs and other contrivances for that purpoſe I could meet with; but, though they appeared correct, the reſults were very erroneous. I examined them by bringing the two limbs of the Sun, ſeen by direct viſion, to touch apparently in the teleſcope of a Sextant, and then obſerved the reflected images in Quickſilver, which ſtill appeared to touch as before; but, on examining the reflected images in the reſt of the artificial horizons, none of them appeared to touch; and the error in many was very conſiderable. I tried a number of other methods with little ſucceſs; as they were, moſtly, combinations of glaſſes: at laſt, accidentally hearing ſome officers ſpeaking of "Tents that would neither turn Sun nor Rain," I conſidered that the rays of the Sun would paſs through Cloth unrefracted; and in conſequence of this idea I applied ſome thin moſquita * curtain as a covering to the Quickſilver, and

* A kind of Silk Gauze as cloſe as Book-muſlin, and perfectly tranſparent: it is to be ſtretched over a hoop which ſtands without touching the veſſel containing the Mercury.

found

found it effectually excluded the wind and admitted the Sun; and what is of equal consequence in this country, it totally kept away those minute insects that disturb the surface of the quicksilver in observing; in short it formed so complete a horizon that I could not before have hoped for any thing so perfect; and it is equally applicable to the sun and stars.

For taking very great or very small elevations of the Sun (which with the common Horizon Sextants are impracticable in the direct method), a polished metalline instrument might be made in the form of part of a hollow obtuse cone: this might have its axis set perpendicular to the Horizon at any time *by means of screws* in a variety of methods; and observations might be made by it with great exactness.

In finding the latitude, when meridian observations cannot be taken, either there is an opportunity of taking Altitudes on both sides of the meridian, or not: when there is not, the best method is to calculate the latitude from two altitudes and the time between, exactly by spherical trigonometry (first correcting the declination to the beginning and end of each interval), as the approximating methods of Dowes and others are totally insufficient: when observations can be taken both before and after noon, it is best to take a number of altitudes in both, and then make out the equal altitudes by proportion; then having found the true time of noon by the usual method, correct the two intervals and the declination to each time, and the latitude may be found as follows:

Add *the Cosine of the angle from noon, to the Cotangent of the declination; the sum is the Cotangent of an arch A.*

Add *the sine of A, the sine of the altitude, and the arithmetical complement of the sine of the declination, together; the sum is the Cosine of an arch B.*

Then *the sum or difference of A and B is the Latitude.*

As every single altitude gives an independent Latitude, it is evident the Latitude may be thus found to great exactness.

An instrument might easily be contrived to measure the Sun's angle of position to great exactness, from whence the Latitude might readily be deduced; a small addition to the common theodolite would be sufficient. The variation of the azimuth near the meridian may also be advantageously applied for the same purpose.

DEMONSTRA-

DEMONSTRATION OF A THEOREM CONCERNING THE INTERSECTIONS OF CURVES.

By Reuben Burrow, *Esq.*

In Stone's Mathematical Dictionary is the following paragraph: "Two geome- "trical lines of any order will cut one another in as many points as the number "expresses which is produced by the multiplication of the two numbers expressing "those orders:" and Mr. Braikonridge in the preface to his *Exercitatio Geometrica de descriptione Curvarum* says: "Mr. George Campbell, now Clerk of "the Stores at *Woolwich*, has got a neat demonstration of the same, which he hopes "he will publish." As it does not appear that Campbell ever published any thing except a paper on the roots of equations, and a small treatise on the plagiarisms of Maclaurin, it is very probable his demonstration is lost, and therefore it may not be improper to publish the following.

The equation of a line of the first order has one root, or function of the Abscis, for the Ordinate; of the second order, two; and so on.

In equations for two right lines the roots may so vary and accommodate themselves to each other, that the quantities expressing the ordinates may be equal; and as there is only one case where this can happen, therefore two right lines can only intersect in one point.

If a line of the first order be compared with a line of the second; or an equation of one root with an equation of two; the root of the first and a single root of the second may so vary as to become equal to each other, or to form an intersection; by the same reason, the single root of the first and the remaining root of the second may each so vary as to become equal, or to form another intersection, and therefore a right line cuts a line of the second order in two points.

If a line of the first order be compared with a line of the n order, it is also evident that the single root of the first line, may in the same manner be so varied with each of the n roots of the second line as to become equal; and therefore a right line may cut a line of the n order in n points.

Let a line of the m order be now compared with a line of the order n; then as each single root of the first line may become equal, in the same manner, to every root in the second; it therefore follows that for every unit in m there may be n inter-

n interſections, and as there are *m* units, there conſequently will be *mn* interſections.

The ſame method may be applied to the determination of the points, line, and ſurfaces, that ariſe from the interſections of lines, ſurfaces, and ſolids; by conſidering that the number of times that *p* may be taken from *m*, and *q* at the ſame time from *n*, will be $= \frac{m.m-1 \ldots\ldots p, \times n.n-1 \ldots q}{1.2.3 \ldots p, \times 1.2.3 \ldots\ldots q}$

XVII.

THE PROCESS OF MAKING ATTAR, OR ESSENTIAL OIL OF ROSES.

By Lieutenant Colonel POLIER.

THE *Attar* is obtained from the Roſes by ſimple diſtillation, and the following is the mode in which I have made it. A quantity of freſh Roſes, for example forty pounds, are put in a Still with ſixty pounds of water, the Roſes being left as they are with their Calyxes, but with the ſtems cut cloſe. The maſs is then well mixed together with the hands, and a gentle fire is made under the Still; when the water begins to grow hot, and fumes to riſe, the cap of the Still is put on, and the pipe fixed; the chinks are then well luted with paſte, and cold water put on the refrigeratory at top: the receiver is alſo adapted at the end of the pipe; and the fire is continued under the Still neither too violent nor too weak. When the impregnated water begins to come over, and the Still is very hot, the fire is leſſened by gentle degrees, and the diſtillation continued till thirty pounds of water are come over, which is generally done in about four or five hours; this Roſe-water is to be poured again on a freſh quantity (forty pounds) of Roſes, and from fifteen to twenty pounds of water are to be drawn by diſtillation, following the ſame proceſs as before; the Roſe-water thus made and cohobated, will be found, if the Roſes were good and freſh, and the diſtillation carefully performed, highly ſcented

ſcented with the Roſes. It is then poured into pans either of earthen ware or of tinned metal, and left expoſed to the freſh air for the night. The *Attar* or *Eſſence* will be found in the morning congealed, and ſwimming on the top of the water; this is to be carefully ſeparated and collected either with a thin ſhell or a ſkimmer, and poured into a vial. When a certain quantity has thus been obtained, the water and feces muſt be ſeparated from the clear eſſence, which, with reſpect to the firſt, will no be difficult to do, as the eſſence congeals with a ſlight cold, and the water may then be made to run off. If, after that, the Eſſence is kept fluid by heat, the feces will ſubſide, and may be ſeparated, but, if the operation has been neatly performed theſe will be little or none. The feces are as highly perfumed as the Eſſence, and muſt be kept, after as much of the Eſſence has been ſkimmed from the Roſe-water as could be. The remaining water ſhould be uſed for freſh diſtillations, inſtead of common water, at leaſt as far as it will go.

The above is the whole proceſs of making genuine *Attar* of Roſes. But, as the Roſes of this country give but a very ſmall quantity of Eſſence, and it is in high eſteem, various ways have been thought of to augment the quantity, though at the expence of the quality. In this country, it is uſual to add to the Roſes when put in the Still, a quantity of Sandal-wood raſpings, ſome more, ſome leſs (from one to five *tolahs*, or half ounces). The Sandal contains a deal of Eſſential Oil which comes over freely in the common diſtillation, and mixing with the Roſe-water and Eſſence, becomes ſtrongly impregnated with their perfume: the impoſition however cannot be concealed; the Eſſential Oil of Sandal will not congeal in common cold, and its ſmell cannot be kept under, but will be apparent and predominate, ſpite of every art. In *Caſhemire* they ſeldom uſe Sandal to adulterate the *Attar*, but I have been informed, to encreaſe the quantity, they diſtil with the Roſes a ſweet-ſcented graſs, which does not communicate any unpleaſant ſcent, and gives the *Attar* a high clear green colour: this Eſſence alſo does not congeal in a ſlight cold as that of Roſes.

Many other ways of adulteration have been practiſed, but all ſo groſs and palpable that I ſhall ſay nothing of them.

The quantity of Eſſential Oil to be obtained from the Roſes, is very precarious and uncertain, as it depends not only on the ſkill of the diſtiller, but alſo on the quality of the Roſes, and the favourableneſs of the ſeaſon: even in Europe where the Chemiſts are ſo perfect in their buſineſs, ſome, as TACHENIUS, obtained only half an ounce of Oil from one hundred pounds of Roſes.—HAMBERG obtained one

one ounce from the ſame quantity; and HOFFMAN above two ounces. (N. B. the Roſes in thoſe inſtances were ſtripped of their calyxes and only the leaves uſed.) In this country nothing like either can be had, and to obtain four *Maſhas* (about one drachm and half) from eighty pounds, which, deducting the calyxes, comes to ſomething leſs than three drachms per hundred pounds of Roſe-leaves, the ſeaſon muſt be very favourable and the operation carefully performed.

In the preſent year, 1787, I had only ſixteen *Tolas* of *Attar* from fifty-four *Maunds*, twenty-three *Seers*, of Roſes, produced from a field of thirty-three *Biggahs*, or eleven *Engliſh* acres; which comes to about 2 dr. per 100 pounds. The colour of the *Attar* of Roſes is no criterion of its goodneſs, quality, or country. I have had, this year, *Attar* of a fine emerald green, of a bright yellow, and of a reddiſh hue, from the ſame ground, and obtained by the ſame proceſs, only of Roſes collected at different days.

The calyxes do not in any ſhape diminiſh the quality of the *Attar*; nor impart any green colour to it; though perhaps they may augment the quantity: but the trouble neceſſary to ſtrip them muſt, and ought to, prevent its being ever put in practice.

Lucknow, May, 1787.

BY MR. MACDONALD, WITH A SPECIMEN OF GOLD.

THE country of *Limong*, on the Iſland of *Sumatra*, immediately contiguous to the preſidency of *Fort Marlbrough*, and between ſeventy and eighty miles, inland, produces the fineſt gold and gold-duſt on that iſland. The *Limong* gold merchants repair, annually, to *Marlbrough*, for the purchaſe of *Opium*, and ſuch other articles as they may be in want of; in exchange for which, they give gold, of ſo pure a nature, as to contain little or no alloy. The gold is found ſometimes in duſt, and often lodged in a very hard ſtone. It is of a whitiſh colour, and reſembles that in which the veins run in the gold mines of *Tiltil* in *Chili*. The gold is extracted by beating the compound maſs in order to diſengage it from the ſtone, which flies off in ſplinters, and leaves the gold cleared of it. This is the mode uſed by a rude people;

people; by which a part of the gold muſt be loſt in the ſplinters of the ſtone, which fly off in beating the maſs. They are totally ignorant of the advantage of grinding it to a groſs powder, mixing it with quickſilver, and ſeparating the earthen and ſtony particles from thoſe of the gold, by the action of a ſtream of water on this paſte, carrying off the former, and leaving the latter precipitated to the bottom by their greater weight. They are almoſt entirely ignorant of the principles of aſſaying and amalgamation, but are extremely expert in ſeparating particles of foreign metals from gold-duſt, by a very ſuperior acuteneſs of viſion, no doubt ariſing from experience, and not a peculiar gift. They have people among them, who are gold-cleaners by occupation. The gold is found in a ſpecies of earth compoſed of a clayiſh red loam. On digging the earth, it is found to conſiſt of ſtrata (under the loam of the ſurface, commonly called ſoil) of irregular-ſhaped ſtones of a mouldering nature, mixed with a red clay, and hard pebbles mixt with a pale red clay, of a more denſe conſiſtency than that of the firſt ſtratum. The firſt ſtratum extends to a depth of three feet and a half, and the ſecond to ſomewhat leſs. The conſiſtency under theſe ſtrata is formed of either hard rock, or of gravel nearly approaching to it. The gold is found mixed with a ſtone of a hard nature, and capable of ſuſtaining a poliſh. It is found near the ſurface, and, generally, in a ſoil freeſt from ſolid rock.

The merchants, who bring the gold for ſale, are not themſelves the finders or gatherers of it, but receive it, for merchandiſe, from the *Malays* inhabiting the interior parts of the country. The native indolence of the *Malay* diſpoſition prevents them from collecting more than is ſufficient to ſupply the few and ſimple wants of a race of men, as yet, unenlightened by civilization and ſcience, and ignorant of the full extent of the advantages of the country inhabited by them. We have not, to this hour, explored a country, which, we have reaſon to ſuppoſe, produces more, or as much gold as either *Peru* or *Mexico*. This may be attributed, partly, to the difficulties incident to the undertaking, and partly, to a want of curioſity, that, indulged, might have been productive of great national and private advantages. The roads leading to this golden country are almoſt impervious; affording only a ſcanty path to a ſingle traveller, where whole nights muſt be paſſed in the open air, expoſed to the malignant influence of a hoſtile climate, in a country infeſted by the moſt ferocious wild beaſts. Theſe are circumſtances that have hitherto checked curioſity, but perſeverance and contrived precaution will ſurmount the obſtacles they furniſh, and ſuch diſcoveries might be made, as would amply compenſate for the difficulties leading to them. The gold-merchants who come from the neigh-

neighbouring and leſs rich countries, give us ſuch accounts of the facility of procuring gold, as border nearly on the marvellous, and would be altogether incredible, if great quantities of that metal produced by them did not, in a great meaſure, evince the certainty of their accounts. I have ſeen an imperfect chart of a part of the interior country, made by an intelligent native, on the ſcale of the rate of his walking, and from the reſpective ſituations of the ſun in regard to his poſition. It contained a chain of what he called Gold Mines, extending in latitude, nearly, not much leſs than three degrees. This chart is in the poſſeſſion of Mr. MILLER of the council of *Fort Marlbrough*, who did me the favour of explaining it. After making allowances for the licence of a traveller, ſome credit may be given to this chart, more eſpecially, as we are well aſſured, that that part of *Sumatra* produces large quantities of fine gold. The reſult of the whole is, that it would be a very laudable object to explore thoſe rich countries, and to eſtabliſh the working of gold-mines in them, as it could be done under a certain proſpect of advantage. The expence ariſing from clearing the country, procuring intelligence, making roads, eſtabliſhing and forming poſts of communication, and of employing profeſſional men, would, undoubtedly, be at firſt very conſiderable, but the reſulting advantages would defray theſe, and render it a matter of ſurpriſe, that a meaſure attended with ſuch obvious utility, had not been adopted at an earlier period.

It is more than probable, that *Sumatra* muſt have been the *Ophir* of SOLOMON's time. This conjecture derives no ſmall force from the word Ophir's being really a *Malay* ſubſtantive of a compound ſenſe, ſignifying a mountain containing gold. The natives have no oral or written tradition on the ſubject, excepting, that the iſland has in former times afforded gold for exportation: whether to the eaſtward or weſtward, remains an uncertainty. We have certain accounts, that the veſſels, that imported this article, were long detained, or did not return in much leſs than a year; it is therefore probable that they wintered, during the violence of the S. W. monſoon, either at Ceylon, or on the N. E. coaſt; and completed their voyages during the moderate part of the other monſoon.

XVIII.

ON THE LITERATURE OF THE HINDUS, FROM THE SANSCRIT. (COMMUNICATED BY GOVERDHAN CAUL.) WITH A SHORT COMMENTARY.——*See the Works of Sir William Jones, Vol. I. p. 349.*

TO THE PRESIDENT.

MY DEAR SIR,

I HEREWITH fend you fix ancient copper-plates, faftened together by a ring in two parcels, each containing three. They were found in digging foundations for fome new works at the fort of *Tanna*, the capital of *Salfet*. The Governor of *Bombay* informed me none of the *Gujerat Bramins* could explain the infcriptions. I obtained permiffion to bring them round with me, being defirous of fubmitting them to the inveftigation of the ASIATICK SOCIETY, under the promife of reftoring them to the proprietor.

I have the honour to be with great refpect,

Dear Sir William,

Your moft faithful humble fervant,

February 15, 1787. J. CARNAC.

XIX.

AN INDIAN GRANT OF LAND IN Y. C. 1018, LITERALLY TRANSLATED FROM THE SANSCRIT, AS EXPLAINED BY RA'MALO'CHAN PANDIT, COMMUNICATED BY GENERAL CARNAC.——

See the Works of Sir William Jones, Vol. I. p. 529.

TO THE PRESIDENT.

DEAR SIR,

I DO myfelf the honour to fend you a few remarks on *Tagara,* and beg leave to fubmit them to your judgement: inquiries of that kind are generally very dry; and unluckily I have no talent for amplification. I have collected all I could find in the ancient authors, and endeavoured, by bringing the whole together, to elucidate a fubject, which muft be interefting to the ASIATICK SOCIETY; and this, I hope, will fecure me their indulgence. I have been as fparing as poffible of *Greek* quotations: I am not fond of them; however, I have ventured a few, which I thought abfolutely neceffary. With refpect to the hiftorical part, you will find, I am not converfant with the *Hindu* antiquities: indeed, I have no time to ftudy languages.

I am,

Dear Sir,

Your moft obedient humble fervant,

Ruffapugla, June 10, 1787. F. WILFORD.

XX. RE-

REMARKS ON THE CITY OF TAGARA.

By Lieutenant FRANCIS WILFORD.

THE expedition of ALEXANDER having made the *Greeks* acquainted with the riches of *India*, they ſoon diſcovered the way by ſea into that country, and, having entered into a commercial correſpondence with the natives, they found it ſo beneficial, that they attempted a trade thither.

PTOLEMY PHILADELPHUS, king of *Egypt*, in order to render the means eaſy to merchants, ſent one DIONYSIUS into the ſouthern parts of *India*, to inquire into the nature of that country, its produce, and manufactures.

It was then *Tagara* began to be known to the *Greeks*, about 2050 years ago.

ARRIAN, in his *Periplus Maris Erythræi*, ſays it was a very large city, and that the produce of the country, at that early period, conſiſted chiefly of coarſe *Dungarees (Othonium vulgare)*, of which vaſt quantities were exported; muſlins of all ſorts *(Sindones omnis generis)*, and a kind of cotton ſtuff dyed of a whitiſh purple, and very much of the colour of the flowers of mallows, whence called *Molochyna*.

All kinds of mercantile goods, throughout the *Deccan*, were brought to *Tagara*, and from thence conveyed on carts to *Baroach (Barygaza)*.

ARRIAN informs us, that *Tagara* was about ten days' journey to the eaſtward of another famous mart, called *Plithana* or *Plúthana*.

That *Plúthana* was twenty days' journey to the ſouthward of *Baroach*; alſo,

That the road was through the *Balagaut* mountains.

And here we muſt obſerve, that the *Latin* tranſlation of the *Periplus** by STUCKIUS is very inaccurate and often erroneous; as in the following paſſage, where ARRIAN ſpeaking of *Tagara*, ſays ·

"Κατάγεται δὲ ἐξ αὐτῶν πορείαις ἁμαξῶν καὶ ἀνοδίαις μεγίσαις ἐις τὴν Βαρύγαζαν."

which STUCKIUS tranſlates thus,

"Ex his autem emporiis, *per loca invia et difficillima, res* Barygazam plauſtris *con-* "*vehuntur*."

But it ſhould be,

* Geographiæ veteris Scriptores Græci minores. Vol. I.

"Ex

" Ex his autem emporiis, *per maximos aſcenſus*, res Barygazam *deorſum feruntur*."

Κατάγω ſignifies *deorſum ferre* (to bring down) not *convehere*.

Ανοδίαι μεγίςαι ſhould be tranſlated *per maximos aſcenſus* : Ανοδια *or* ἄνοδος in this place ſignifies *an aſcent*, *a road over hills* ; and this meaning is plainly pointed out by the words κατάγεται and μεγίςαις.

In ſhort ἀνοδίαι μεγίςαι is the true tranſlation of the *Hindoo* word *Bala-gaut*, the name of the mountains, through which the goods from *Tagara* to *Baroach* uſed to be conveyed.

This paſſage in ARRIAN is the more intereſting, as it fixes the time when the *Bala-gaut* mountains were firſt heard of in *Europe*.

The bearing from *Tagara* to *Plúthana* is expreſsly mentioned by ARRIAN (πρὸς ανατολὴν) but is left out by STUCKIUS.

PLUTHANA is an important point to be ſettled, as it regulates the ſituation of *Tagara*.

It ſtill exiſts, and goes nearly by the ſame name, being called to this day *Pultanah* : it is ſituated on the ſouthern bank of the *Godávery*, about 217 Britiſh miles to the ſouthward of *Baroach*.

Theſe 217 miles, being divided by twenty, the number of days travellers were between *Pultanah* and *Baroach* according to ARRIAN, give nearly eleven miles per day, or five coſs, which is the uſual rate of travelling with heavy loaded carts.

The Onyx and ſeveral other precious ſtones are ſtill found in the neighbourhood of *Pultanah*, as related by ARRIAN ; being waſhed down by torrents from the hills during the rains, according to PLINY.

ARRIAN informs us that the famous town of *Tagara* was about ten days' journey to the eaſtward of *Pultanah*.

According to the above proportion, theſe ten days (or rather ſomewhat leſs *) are equal to about 100 Britiſh miles, and conſequently *Tagara*, by its bearing and diſtance from *Pultanah*, falls at *Deogir*, a place of great antiquity, and famous through all *India* on account of the *Pagodas* of *Eloura*. It is now called *Doulet-abad* and about four coſs N.W. of *Aurungabad*.

PTOLEMY agrees very well with ARRIAN, with reſpect to diſtances and bearings, if we admit that he has miſtaken *Baithana* or *Paithana* for *Plithana* ; and this, I am pretty ſure, is really the caſe, and may be eaſily accounted for, as there is very little difference between ΠΑΙΘΑΝΑ and ΠΑΙΘΑΝΑ in the *Greek* character.

* Ὡς ἡμερῶν δέκα quaſi dies decem.

Paithana

Paithana, now *Pattan* * or *Putten*, is about half way between *Tagara* and *Plithana*.

According to PTOLEMY, *Tagara* and *Pattan* were ſituated to the northward of the Baund-Ganga (*Binda* or *Bynda* river), commonly called *Godávery*: and here PTOLEMY is very right.

In Mr. BUSSY's *marches*, *Pattan* is placed to the ſouthward of the *Godvávery*; but it is a miſtake.

It appears from ARRIAN's *Periplus*, that, on the arrival of the *Greeks* into the *Deccan*, above 2000 years ago, *Tagara* was the *Metropolis* of a large diſtrict called *Ariaca*, which comprehended the greateſt part of Subah *Aurangabad* and the ſouthern part of *Concan*; for the northern part of that diſtrict, including *Damaun*, *Callian*, the iſland of *Salſet*, *Bombay*, &c. belonged to the *Rajah* of *Larikeh* or *Lar*, according to ARRIAN and EBN SAÏD AL MAGREBI.

It is neceſſary to obſerve here, that, though the author of the *Periplus* is ſuppoſed to have lived about the year 160 of the preſent era, yet the materials, he made uſe of in compiling his directory, are far more ancient: for, in ſpeaking of *Tagara*, he ſays that the *Greeks* were prohibted from landing at *Callian*, and other harbours on that coaſt. Now it is well known, that, after the conqueſt of *Egypt*, the *Romans* had monopolized the whole trade to *India*, and would allow no foreigner to enter the Red Sea; and conſequently this paſſage has reference to an earlier period, previous to the conqueſt of *Egypt* by the *Romans*.

About the middle of the firſt century, *Tagara* was no longer the capital of *Ariaca*, *Rajah* SALBAHAN having removed the ſeat of the empire to *Pattan*.

PTOLEMY informs us, that *Paithana* or *Pattan* had been the reſidence of a prince of that country, whoſe name the *Greeks* have ſtrangely disfigured: we find it variouſly ſpelt, in different MSS. of PTOLEMY, *Siripolemæus*, *Siropolemæus*, *Siroptolemæus*, &c.

Yet when we conſider, that, whenever *Pattan* is mentioned by the *Hindoos*, they generally add, it was the reſidence of *Rajah* SALBAHAN †, who in the dialect of the *Deccan* is called *Salivanam* or *Salibanam*, I cannot help thinking, that the *Greeks* have disfigured this laſt word *Salibanam* into *Saripalam*, from which they have made *Siripolemæus*, *Siropolemæus*, &c.

BICKERMAJIT ruled for ſome time over the northern parts of the *Deccan*; but the *Rajahs*, headed by SALBAHAN, having revolted, they gave him battle, and he

* *Patinæ* Tab. Peutinger. *Patinna* Anonym. Ravenn. † (Making uſe of the very words of Ptolemy.)

was

was ſlain. *Tagara* became again the *Metropolis* of *Ariaca*; at leaſt it was ſo towards the latter end of the eleventh century, as it appears from a grant of ſome lands in *Concan*, made by a *Rajah* of *Tagara*: this grant ſtill exiſts, and was communicated to the ASIATICK SOCIETY by General CARNAC.

When the *Muſſulmans* carried their arms into the *Deccan* about the year 1293, *Tagara* or *Deoghir* was ſtill the reſidence of a powerful *Rajah*, and remained ſo till the time of SHAH-JEHAN, when the diſtrict belonging to it became a *Subah* of the *Mogul* empire. Then *Tagara* was deſerted, and *Kerkhi*, four coſs to the ſouth-eaſt of it, became the capital: this place is now called *Aurungabad*.

Thus was deſtroyed the ancient kingdom or *Rajaſhip* of *Tagara*, after it had exiſted with little interruption above 2000 years: that is to ſay, as far as we can trace back its antiquity.

It may appear aſtoniſhing, that though the *Rajah* of *Tagara* was poſſeſſed of a large tract on the ſea coaſt, yet all the trade was carried on by land.

Formerly it was not ſo. On the arrival of the *Greeks* into the *Deccan*, goods were brought to *Callihan*, near *Bombay*, and then ſhipped off. However, a *Rajah* of *Larikeh*, or *Lar*, called *Sandanes*, according to ARRIAN, would no longer allow the *Greeks* to trade either at *Callian*, or at the harbours belonging to him on that coaſt, except *Baroach*; and whenever any of them were found at *Callian* or in the neighbourhood, they were confined and ſent to *Baroach* under a ſtrong guard. ARRIAN, being a *Greek* himſelf, has not thought proper to inform us what could induce the *Rajah* to behave in this manner to the *Greeks*; but his ſilence is a convincing proof that they had behaved amiſs; and it is likely enough that they had attempted to make a ſettlement in the iſland of *Salſet*, in order to make themſelves independent, and facilitate their conqueſts into the *Deccan*.

The fears of the *Rajah* were not groundleſs; for the *Greek* kings of *Bactriana* were poſſeſſed of the *Punjab*, *Cabul*, &c. in the north of *India*.

There were other harbours, to the ſouth of *Callian*, belonging to the *Rajah* of *Tagara*; but they were not frequented, on account of *Pirates*, who, according to PLINY, ARRIAN and PTOLEMY, infeſted theſe countries, in the very ſame manner they do now.

XX. ON

XX.

ON THE PANGOLIN OF BAHAR. *See the Works of Sir William Jones, Vol. I. p.* 545.

XXI.

INSCRIPTIONS ON THE STAFF OF FI'RU'Z SHAH. TRANSLATED FROM THE SANSCRIT, AS EXPLAINED BY RA'DHA'CA'NTA SARMAN. *See the Works of Sir William Jones, Vol. I. p.* 539.

XXII.

A CONVERSATION WITH ABRAM, AN ABYSSINIAN, CONCERNING THE CITY OF GWENDER AND THE SOURCES OF THE NILE. BY THE PRESIDENT. *See the Works of Sir William Jones, Vol. I. p.* 515.

ON THE COURSE OF THE NILE. *See the Works of Sir William Jones, Vol. I. p.* 519.

XXIII. ON

XXIII.

ON THE TRIAL BY ORDEAL, AMONG THE HINDUS.—BY ALI' IBRA'HI'M KHA'N, CHIEF MAGISTRATE AT BANA'RES.

Communicated by WARREN HASTINGS, *Esq.*

THE modes of trying offenders by an appeal to the Deity, which are defcribed at large in the *Mitácſherá*, or Comment on the *Dherma Saſtra* in the *Chapter of Oaths*, and other ancient books of *Hindu* law, are here fufficiently explained, according to the interpretation of learned *Pandits*, by the well-wiſher to mankind, ALI' IBRA'HI'M KHA'N.

The word *Divya* in *Sanſcrit* fignifies the fame with *paricſhá*, or *parikhyà* in *Bháſhà*, *kaſam* in *Arabick*, and *ſaucand* in *Perſian*; that is, an *oath*; or the form of invoking the fupreme Being to atteft the truth of an allegation; but it is generally underftood to mean the trial by *Ordeal*, or the form of appealing to the *immediate* interpofition of the divine power.

Now this trial may be conducted in *nine* ways: firft, by the *balance*; fecondly, by *fire*; thirdly, by *water*; fourthly, by *poiſon*; fifthly, by the *Cóſha*, or water in which an idol has been waſhed; fixthly, by *rice*; feventhly, by *boiling oil*; eighthly, by *red-hot iron*; ninthly, by *images*.

I. Ordeal by the balance is thus performed. The beam having been previoufly adjufted, the cord fixed, and both fcales made perfectly even, the perfon accufed and a *Pandit* faft a whole day; then, after the accufed has been bathed in facred water, the *hóma*, or *oblation* prefented to *fire*, and the deities worſhipped, he is carefully weighed; and, when he is taken out of the fcale, the *Pandits* proftrate themfelves before it, pronounce a certain *mentra* or *incantation*, agreeably to the *Sáſtras*, and, having written the fubftance of the accufation on a piece of paper, bind it on his head. Six minutes after, they place him again in the fcale; and, if he weigh more than before, he is held guilty; if lefs, innocent; if exactly the fame, he muft be weighed a third time; when, as it is written in the *Mitácſherá*, there will certainly be a difference in his weight. Should the balance, though well fixed, break down, this would be confidered as a proof of his guilt.

II. For

DA'SA: the three laſt were *Pandits* of the court. When GANE'SA had been worſhipped and the *hóma* preſented, according to the *Sáſtra*, they ſent for this well-wiſher to mankind; who, attended by the two *Dárógbas* of the *Díváni* and *Faujdári* courts, the *Cotwál* of the town, the other officers of the court, and moſt of the inhabitants of *Benáres*, went to the place of trial; where he laboured to diſſuade RA'MDAYA'L and his father from ſubmitting to the ordeal; and apprized them, that, if the hand of the accuſed ſhould be burned, he would be compelled to pay the value of the goods ſtolen, and his character would be diſgraced in every company. RA'MDAYA'L would not deſiſt: he thruſt his hand into the veſſel, and was burned. The opinion of the *Pandits* was then taken; and they were unanimous, that, by the burning of his hand, his guilt was eſtabliſhed, and he bound to pay RISHI'SWARA BHATTA the price of what he had ſtolen; but, if the ſum exceeded five hundred *aſhraſi's*, his hand muſt be cut off by an expreſs law in the *Sáſtra*; and a mulct alſo muſt be impoſed on him according to his circumſtances.

The chief magiſtrate, therefore, cauſed RA'MDAYA'L to pay RISHI'SWARA ſeven hundred rupees in return for the goods, which had been ſtolen; but, as amercements in ſuch caſes are not uſual in the courts of judicature at *Benáres*, the mulct was remitted, and the priſoner diſcharged.

The record of this conviction was tranſmitted to *Calcutta* in the year of the MESSIAH 1783; and, in the month of *April*, 1784, the Governor General, IMA'-DU'DDAU'LAH JELA'DET JANG BEHA'DER, having ſeen the preceding account of trials by ordeal, put many queſtions concerning the meaning of *Sanſcrit* words, and the caſes here reported; to which he received reſpectful anſwers. He firſt deſired to know the preciſe meaning of *hóma*, and was informed that it meant the oblations made to pleaſe the deities, and compriſed a variety of things: thus in the *agni hóma*, they throw into the *fire* ſeveral ſorts of wood and graſs, as *palás* wood, *c'hadira* wood, *racta chandan* or red ſandal, *pippal-wood*, *ſami*, and *cuſha* graſs, *dubha*, together with ſome ſorts of grain, fruit and other ingredients, as black ſeſamum, *barley*, *rice*, *ſugar-cane*, *clarified butter*, *almonds*, *dates*, and *gúgal* or *bdellium*. To his next queſtion, "how many ſpecies of *hóma* there were?" it was anſwered, that different ſpecies were adapted to different occaſions: but that, in the ordeals by hot iron, and hot oil, the ſame ſort of oblation was uſed. When he deſired to know the meaning of the word *mentra*, he was reſpectfully told, that in the language of the *Pandits*, there were three ſuch words, *mentra*, *yantra*, and *tantra*; that the *firſt* meant a paſſage from one of the *Védas*, in which the names of certain deities occurred; the

ſecond,

ſecond, a ſcheme of figures, which they write with a belief that their wiſhes will be accompliſhed by it; and the third, a medical preparation, by the uſe of which all injuries may be avoided; for they are ſaid to rub it on their hands, and afterwards to touch red-hot iron without being burned. He then aſked, how much barley, moiſtened with curds, was put into the hands of the accuſed perſon; and the anſwer was, *nine grains*.

His other queſtions were thus anſwered: "that the leaves of *pippala* were ſpread about in the hands of the accuſed, not heaped one above another; that the man, who performed the fire ordeal, was not much agitated, but ſeemed in full poſſeſſion of his faculties; that the perſon tried by hot oil was at firſt afraid, but perſiſted, after he was burned, in denying the theft; nevertheleſs, as he previouſly had entered into a written agreement, that, if his hand ſhould be hurt, he would pay the value of the goods, the magiſtrate for that reaſon thought himſelf juſtified in compelling payment; that, when the before-mentioned ingredients of the *hóma* were thrown into the fire, the *Pandits*, ſitting round the *hearth*, ſung the *Slócas* preſcribed in the *Sáſtra*. That the form of the hearth is eſtabliſhed in the *Véda* and in the *Dherma Sáſtra*; and this fire-place is alſo called *Védi*; that, for the ſmaller oblations, they raiſe a little ground for the *hearth*, and kindle fire on it; for the higher oblations, they ſink the ground to receive the fire, where they perform the *hóma*, and this ſacred hearth they call *cunda*." The Governor then aſked, why the trials by fire, by the hot ball, and the veſſel of oil, if there be no eſſential difference between them, are not all called fire-ordeals; and it was humbly anſwered, that, according to ſome *Pandits*, they were all three different, whilſt others inſiſted, that the trial by fire was diſtinct from that by the veſſel, though the trial by the hot ball and the head of a lance were the ſame; but that, in the apprehenſion of his reſpectful ſervant, they were all *ordeals by fire*.

THE INDIAN LAW OF ORDEAL, VERBALLY TRANSLATED FROM YA'GYAWALCYA.

1. THE balance, fire, water, poiſon, the idol—theſe are the ordeals uſed here below for the proof of innocence, when the accuſations are heavy, and when the accuſer offers to hazard a mulct (if he ſhould fail):

2. Or

181 से 206 तक
पेज नही है।

2. Or one party may be tried, if he pleafe, by ordeal, and the other muft then rifque an amercement; but the trial may take place even without any wager, if the crime committed be injurious to the prince.

3. The fovereign, having fummoned the accufed, while his clothes are yet moift from bathing at funrife, before he has broken his faft, fhall caufe all trials by ordeal to be conducted in the prefence of *Bráhmans*.

4. The balance is for women, children, old men, the blind, the lame, *Bráhmans*, and the fick; for the *Súdra*, fire or water, or feven barley-corns of poifon.

5. Unlefs the lofs of the accufer amount to a thoufand pieces of filver, the accufed muft not be tried by the red-hot ball, nor by poifon, nor by the fcales; but, if the offence be againft the king, or if the crime be heinous, he muft acquit himfelf by one of thofe trials in all cafes.

6. He, who has recourfe to the balance, muft be attended by perfons experienced in weighing, and go down into one fcale, with an equal weight placed in the other, and a groove (with water in it) marked on the beam.

7 "Thou, O balance, art the manfion of truth; thou waft anciently contrived "by deities: declare the truth, therefore, O giver of fuccefs, and clear me from all "fufpicion.

8. "If I am guilty, O venerable as my own mother, then fink me down; but "if innocent, raife me aloft." Thus fhall he addrefs the balance.

9. If he fink, he is convicted, or if the fcales be broken; but, if the ftring be not broken, and he rife aloft, he muft be acquitted.

10. On the trial by fire, let both hands of the accufed be rubbed with rice in the hufk, and well examined: then let feven leaves of the *Afwatt'ha* (the religious fig-tree) be placed on them, and bound with feven threads.

11. "Thou, O fire, pervadeft all beings; O caufe of purity, who giveft evidence "of virtue and fin, declare the truth in this my hand."

12. When he has pronounced this, the prieft fhall place in both his hands an iron ball, red hot, and weighing fifty * *pala's*.

13. Having taken it, he fhall ftep gradually into feven circles, each with a diameter of fixteen fingers, and feparated from the next by the fame fpace.

14. If, having caft away the hot ball, he fhall again have his hands rubbed with rice in the hufk, and fhall fhow them unburned, he will prove his innocence.

* A *pala* is four *carfha's*, and a *carfha*, eighty *rattica's*, or feeds of the *Gungà* creeper, each weighing above a grain and a quarter, or, correctly, $1\frac{5}{16}$ gr.

Should

Should the iron fall during the trial, or ſhould a doubt ariſe (on the regularity of the proceedings), he muſt be tried again.

15. "Preſerve me, O Varuna, by declaring the truth." Thus having invoked the God of waters, the accuſed ſhall plunge his head into the river or pool, and hold both thighs of a man, who ſhall ſtand in it up to his navel.

16. A ſwift runner ſhall then haſten to fetch an arrow ſhot at the moment of his plunging; and if, while the runner is gone, the prieſt ſhall ſee the head of the accuſed under water, he muſt be diſcharged as innocent.

17. "Thou, O poiſon, art the child of BRAHMA', ſtedfaſt in juſtice and in truth: "clear me then from this heavy charge, and, if I have ſpoken truly, become nectar "to me."

18. Saying this, he ſhall ſwallow the poiſon *Sárnga,* from the tree, which grows on the mountain *Himálaya*; and, if he digeſt it without any inflammation, the prince ſhall pronounce him guiltleſs.

19. Or the prieſt ſhall perform rites to the image of ſome tremendous deity, and, having bathed the idol, ſhall make the accuſed to drink three handfuls of the water, that has dropped from it:

20. If, in fourteen days after, he ſuffer no dreadful calamity from the act of the deity or of the king, he muſt indubitably be acquitted.

XXIV.

THE SECOND ANNIVERSARY DISCOURSE, DELIVERED 24 FEBRUARY, 1785. *See the Works of Sir William Jones, Vol. I. p. 9.*

XXV.

THE THIRD ANNIVERSARY DISCOURSE, DELIVERED 2 FEBRUARY, 1786. *See the Works of Sir William Jones, Vol. I. p. 19.*

XXVI. COR-

XXVI.

CORRECTIONS OF THE LUNAR METHOD OF FINDING THE LONGITUDE.

By Mr. REUBEN BURROW.

THE intent of the following remarks is to point out an error in the uſual practice of making the lunar obſervations, and another in the method of computation.

It is well known that a little before and after the conjunction, the whole hemiſphere of the moon is viſible, and the enlightened creſcent ſeems to extend ſome diſtance beyond the duſky part. Now, having determined the longitude of a place from the eclipſes of Jupiter's ſatellites, I took ſeveral ſets of diſtances of the moon's limb from a ſtar, near the time of the conjunction, both from the bright and the duſky parts of the circumference, and having calculated the reſults, I found that thoſe taken from the duſky part were much nearer the truth than the others: the nature of the error evidently ſhewed, that the ſtar had really been at ſome diſtance from the limb, when it appeared to be in contact with it; and, as the error was a conſiderable part of a degree, I ſaw it would be of conſequence to diſcover the cauſe of it; which, however, was obvious enough from NEWTON's principles, and may be explained as follows.

Let AD be the diameter of the moon, and A the centre of a ſtar in contact with the moon's limb; now, as the enlightened part of the moon evidently appears to extend beyond the duſky part, let the concentric circle BC repreſent the moon's limb thus apparently magnified, and ſuppoſe the ſtar to be equally magnified; then with the centre A, and the diſtance DC deſcribe a circle, which conſequently will touch the moon's apparent circumference inwardly; now as this laſt is a conſequence of ſuppoſing the centre of the ſtar to touch the circumference of the moon, excluſive of the deception, it follows, that *the proper method of taking the diſtance, is to make the ſtar appear to touch the moon inwardly.*

But all the writers on this ſubject have particularly directed that the ſtar be made to touch *outwardly:* let B, therefore, be the point of contact, and *a* the centre; the error then is Aa, or the ſum of the apparent increaſe of the moon's radius and the apparent radius of the ſtar: this quantity, it is evident, will make a

conſiderable

confiderable error in the refult, and errors arifing from this fource are the more to be attended to, as they are not of a kind to be leffened by increafing the number of obfervations. The fame reafoning is applicable to the fun and moon with very little alteration.

The diftance of the moon from the fun or a ftar, at each three hours, is given in the Nautical Ephemeris, and the method of inferring the time, for any intermediate diftance, is by fimple proportion : this would be juft if the moon's motion was uniform : but as that is not the cafe, the velocity fhould be taken into the account, as well as the fpace, in determining the time, taken by the moon to move any given diftance ; and the proper meafure of the velocity is fuch a quantity, as has the fame ratio to the fpace defcribed, as three hours have to the time, that has been actually taken to move the given diftance : to find this quantity correctly would require interpolation, but it will be fufficient in practice to find the time firft by the common method, and then to correct the interval for three hours to that time, by taking a proportional part of the fecond difference of the moon's diftance at the beginning of each three hours ; fuppofing the firft differences to anfwer to the middle of each interval.

The laft correction, though not fo confiderable as the firft, will often bring the refult nearer to the truth by three, four, five, or fix miles, and fometimes more, which in geographical determinations is of confequence ; and, by paying attention to thofe and fome other caufes of error, which fhall be pointed out hereafter, the refults in general will be much nearer to the truth than is ufually imagined. It is common to throw blame on the imperfections of the lunar tables, but it would be much more properly applied to bad inftruments and bad obfervers.

APPENDIX

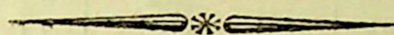
APPENDIX

TO THE

FIRST VOLUME

OF

ASIATICK RESEARCHES.



A

METEOROLOGICAL JOURNAL,

Kept by Colonel T. D. PEARSE, *from* 1st *March,* 1785, *to* 28th *February,* 1786.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	March 1785. Miſcellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.	Inches.	
	h. m.										
	22.49	☽ L. Q.									
3											(a)
6	7.15 A	29,963		77		thin	3	SSW	1		(b)
7	3. P	29,915		79		thin	5	SSW	3		(c)
	6.30 P					thick thund.	10	SSW	3		
8	7.30 A	30,00		76		ditto	9	SSW	2		(d)
	7. P					thick	10				
	8. P							NW			
9	7. A	30,032		75,5		thick thund.	8	NW	1		(e)
	1.55 P	29,97		79,5		none					
	16,27	☽ New									
10	4.50 P					thick thund.	9	NW	6		
	5.39 P					ditto	8	S	3		
	6.15 P	29,95		76,5		ditto	8	S	4	,142	(f)
11	7. A	30,00		70				S by W	1		
12	6.35 A	29,95		79				S	1		(g)
13	6. A	29,85		79		thin	2	S by E	1		(h)
	2. P					thick	4	S	3		
	4. P					thick thund.	8	S by E	3		
	5.2 P	29,77		80,5		ditto	9	S	5	,259	
	5.30 P										
14	7. A					thick	6	SSE	2		
	2.20 P	29,816		83		ditto	9	SSE	2		
15	6.45 A	29,854		79,5				S by E	1		(i)
	8.25 P					thick thund.	9	N	5		
16	7.40 A	29,873		78		ditto	10			,022	(k)
	2.20 P	29,813		82		thick looſe	8	SSW	4		
	12.52	☽ F.Q.									
17	7.15 A	29,887		80		thick	5	SE	1	,039	(l)
	2.30 P	29,828		84		ditto	4	SSE	2		
						Carried forward,			–	,462	

(*a*) Laſt Friday the fog was exceſſive, and did not begin to clear till 9. Saturday the ſame. Sunday it began to clear about 7.

(*b*) The fog is gone off to-day already: it was but ſlight.

(*c*) Much lightning in the NW. and diſtant thunder.

(*d*) Much lightning in the NW. A puff from the NW. but without rain or thunder.

(*e*) There was a very ſmall ſprinkling of rain juſt now.

(*f*) In the morning we had a thick fog, which formed into clouds, and went over to the N. and at 2 maſſes were formed there: from whence at 4'50 we had a ſtorm, which was over in half an hour; and at *Dumdum*, about 10 miles off, they had heavy hail.

(*g*) Fog ſo thick that an object at a 100 yards is inviſible.

(*h*) 6. A. Foggy. A ſtorm will come on in the evening. 4. P. Diſtant thunder. 5.2 P. We have had a furious ſtorm of hail, with thunder and lightning, and SW to SSE 6. 5.30 P. Loud thunder ſtill continues in the ENE. where the maſs now is.

(*i*) 6.45 A. Every thing hidden in fog, which will produce a ſtorm at night. 8.25 P. Much lightning, and the expected ſtorm coming on.

(*k*) 7.40 A. The thunder rolled all night: exceſſive lightning.

(*l*) 7.15 A. A ſtorm began to gather about 5 P. and we had much lightning about 10. Between 12 and 1 it began, and the wind very violent. The thunder cloſe, and ſo heavy, that it jarred the whole houſe like an earthquake. 2.30 P. It has been very gloomy at times all day.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	March 1785. Miscellaneous.
				In.	Out.	Kinds.	Quant.	Quarter.	Force.		
								Brought forward,		,462	
18	6. A	29,915		80		thin	3	S	1		
	2. P	29,85		86		loose	3	S	4		
19	2 20 P	29,813		84				W by S	2		
20	1.30 P	29,833		85		thin	9	SSW	3		
21	6.15 A	29,813		81		thin	2	SW by S	2		
	2. P	29.80		86		thick & thin	5	S by W	4		
22	6.30 A	29,825		82		thick loose	10	SW by S	3		(m)
	2. P	29,837		86		thick	3	SW by S	5		
23	2. P	29,784		85,5		thin	7	SW by S	3		(n)
	7.45					thick thund.	10	SSW	5	,084	
24	8. A	29,87		81,5		thick	7				(o)
	2. P	29,825		85		thick thund.	10	W by S	2		
	9. P									,001	
	h. m.										
	16.02	☽ Full									
25	6.15 A	29,859		82		thick	4	SSE	2		
	2. P	29.866		86		none		S	3		
26	5.45 A	29,915		82		thick loose	10	S	1		(p)
	2.15 P	29,87		86,2				S	4		
27	7.15 A	29,865		82		thick	10				
	2.15 P	29,785		87				S	2		
28	6.45 A	29,795		81				S	1		(q)
	2.10 P	29,798		87,5				SSW	4		
29	6.45 A	29,862		81,5		thin	2	S½W	1		(r)
	2.15 P	29,830		87,0				SSW½W	3		
30	6.45 A	29,822		81,5		thin	5	S½E	1		(s)
	1.30 P	29,848		83,5		thick	10	NE	1		
31	7.15 A	29,862		79,0		ditto	10	NNE	1	,007	(t)
	2. P	29,797		83,0		ditto	9	NNW	1		
								TOTAL IN MARCH, –		,554	

(m) Great appearance of approaching rain and ftorms.

(n) 8. A. The morning was very cloudy, and the wind ftrong; it prefaged a ftorm; and I ftill expect one before midnight. At fun-fet it threatened, and at 7 P. the lightning began to be vivid in the WNW. It rained for about ten minutes. The thunder was very near.

(o) 8. A. The wind began about 11. P. and raged till paft 1 o'clock with uncommon violence. 2. P. Exceffively gloomy. 9. P. At 7 we had a thunder guft, which was foon over, with a fprinkling only.

(p) 5.45 A. The clouds began to collect at 8 laft night and are very thick. 2.15 P. The clouds continued very thick till paft 10, and were not difpelled till paft 1.

(q) 6.45 A. Exceffively thick fog. 2.10 P. The true along-fhore wind, which diforders the whole frame.

(r) 6.45 A. Foggy. Laft night the clouds were thick 10 at 11 P.

(s) 6.45 A. Foggy. It has been extremely gloomy ever fince 7 o'clock, and about noon we had a few drops of rain.

(t) 7.15 A. We had a fmall fhower of rain about fun-rife, and there has been more at a diftance from the feel of air.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	April 1785. Miscellaneous.
1	6.45 A	29,866		79,5		thick thund.	10	WNW	2		
	2.10 P	29,816		82		thick	10	SE	1		(a)
	10-16	☽ L. Q.									
2	6.45 A	29,828		77				E$\frac{1}{2}$S	1		
	2. P	29,777		83,7		thick ſcat.	3	WNW	3		
3	6.45 A	29,765		79				S by W	1		
	2. P	29,711		85,5		none		WNW	2		
4	7. A	29,785		80				SE by S	1		
	2. P	29,750		86				WNW	1		
5	6. A	29,763		78		thick	2	SE	2		(b)
	1.45 P	29,760		86,7		thick gather.	3	S by E	2		
6	6.30 A	29,76		80,5		thick	5	E	3		(c)
	2. P	29,748		88		ditto	1	SW$\frac{1}{2}$S	4		
7	7. A	29,82		80							
	2. P	29,79		87,5				SSW	5		(d)
8	7. A	29,846		81,5		looſe	4	S by E	2		(e)
	2. P	29,761		87,5	94			SW$\frac{1}{2}$S	4		
	1.39	☽ New									
9	6.30				81	thick looſe	10	S	2		
	2. P	29,75		88,5	96,5			S by W	4		
10	7.45 A	29,76		84		thick	9	SSW	5		
	2. P	29,718		88	92,2			SSW	5		(f)
	5.30 P	29,708		87	88	thick	10	SSW	5		
11	6.40 A	29,788		85	81,5	thin	7	SSW	2		(g)
	2. P	29,766		89,5	96,0	ditto	8	SW by S	3		
	6.15 P	29,779		88	83,15	thick thund	8	SSW	3		(h)
	8. P									,016	
12	7.15 A	29,740			83						
	2.30 P	29,765		90,5	100,5			NE	2		
13	6.30 A	29,783		82	81	thick & thin	10	SW by S	2		
	10. P	29,818		84	83,5	thick	10	N	1	,002	(i)
14	7. A	29,820		83	85	ditto	9	S by W	3		
	2.30 P	29,848		86	88	ditto	10	S	2		(k)
15	7. A	29,915	28	82	81	ditto	10	S$\frac{1}{2}$W	1		
	1.45 P	29,90	22,5	85	92	ditto	10	NE	1		(l)
								Carried forward,	–	,018	

(*a*) We had a ſprinkling rain to-day of half an hour's duration.

(*b*) Exceſſively thick haze.

(*c*) Laſt night the clouds were ſo heavy that they ſeemed to threaten a ſtorm.

(*d*) There were flying clouds from 8 till 11 to-day, but all are gone.

(*e*) Yeſterday evening there was a maſs over *Calcutta*, and much lightning and ſome thunder, and this morning we had a fog.

(*f*) There will be a ſtorm to-day. 5.30 P. Diſtant thunder. The bank is not yet formed.

(*g*) The wind was tempeſtuous the greateſt part of the night, but we had not any rain. It is now foggy, and threatens.

(*h*) Yeſterday there was every reaſon to expect a violent ſtorm, but it went off from us. To-day there was but little expectation, and it now rains ſmartly, and there has been a great deal of thunder; and all this without any change of wind.

(*i*) We had a ſmall ſhower at 1, and another juſt now. The wind was NE 2 all the afternoon.

(*k*) The wind changed ſuddenly juſt after laſt obſervation to the S again, and we had a very windy night. 2.30 P. It has been gloomy all day.

(*l*) A ſprinkling rain in very diſtant drops. The wind of the night was of ſuch a kind, that it prevented the poſſibility of ſleeping.

The morning rain, and a like ſprinkling ſince, could not be meaſured.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	April 1785. Miscellaneous.
								Brought forward,		,018	
16	7. A	29,95	15	80	82,5	thick	10	N	4		(*m*)
	8.15 A	29,99	17,5	80	74	ditto	10	NE by E	3	,087	
	2.15 P	29,893	29	80	80	ditto	10	NE	4		
	3-44 P	☽ F. Q.									
17	7.15 A	29,864	32	70,5	86	thick	10	E by N	4	1,314	(*n*)
	2.15 P	29,79	43	78	75	ditto	10	S by E	3	,763	
	8.20 P	29,828	44	78	74	thick loofe	10	SE½E	3	,752	
18	6.15 A	29,80	46	79,5	76	thick	9	SSW½S	1	,284	(*o*)
	2.15 P	29,839	48,3	80,5	86	thick white fc.	4	NW	1		
19	7. A	29,913	50	80		thick loofe	7				(*p*)
	2.15 P	29,813	43,5	83,5	90	thick white	7	SW½S	2		
20	5.40 A	29,8	43,5	79,5	76	thin	4	S by W	2		
	2.25 P	29,792	42	86	90	thick loofe	4	S	4		
	10. P	29,881	36,5	76,5	80,9	thick	10	NNE	3		(*q*)
21	6. A	29,812	40	76,9	73,5	ditto	3	SSE	3		
22	8. A	29,876	41	77	74	ditto	10	SW by S	3	,410	(*r*)
	2. P	29,785	36,5	82	89	fcattered	2	SSW	3	,007	
23	5. A	29,750	50	79	77			SW	2		
	2.15 P	29,760	46	86	93			S by W	2		
24	7. A	29,748	54	82,5	84			S	2		
	2. P	29,722	45	87,5	94	fcattered	2	S by W	3		
	8-8 P	☽ Full									
25	6.30 A	29,71	53,5	83	83			SSE	2		
	2. P	29,71	42	90,5	96,5	fcattered	3	S½E	4		(*s*)
26	7.15 A	29,740	47	84	85	ditto	3	S	2		(*t*)
	2. P	29,735	39	89	94	thick	9	S by E	4		
27	7. A	29,705	47,5	84						,220	(*v*)
	2. P	29,697	43	87,5	91	thick	9	S by E	4		
	7. P	29,711	43	83	86	thick thund.	10	NNE to	7		
	8. P							NNW		,170	
	9.45 P							WNW	9	,270	
28	6.45 A	29,713	40	81,5	78	none		SW by S	2	,013	(*w*)
	2. P	29,723	44	87,5	93			SW by S	2		
29	6. A	29,713	49	83,5	80,5	none		SW by S	2		(*x*)
	2. P	29,753	37	87,5	93			W by S	2		
30	7. A	29,79	50	83,5	84	none		SW by S	2		
	2. P	29,79	37,5	91	97,5	thick fmall fcat.	2	SSW	4		
								TOTAL IN APRIL,	–	4.308	

(*m*) It has been a blowing cold night; wind northerly, and it fprinkles rain. 8.15 A. A heavy fhower juft over, and drizzling rain ftill continues. 2.15 P. We have had more fprinkling rain.

(*n*) About 6 yefterday it began to rain in drops; before 9 it was fmart rain. It has continued all night, and ftill rains. 2.15 P. It has rained inceffantly all day. It ftill rains hard, and now the clouds begin to break a little. 8.20 P. It ftill fprinkles.

(*o*) It began to thunder at a great diftance about 8, and by 12 it was near us; and this put an end to the rain before 3. A.

(*p*) The morning was foggy.

(*q*) A fmall fhower of rain, and the wind changed from the S. to NNE.

(*r*) At 12. P. a mafs formed in the NW. came on; and in a fhort time we had a ftorm without thunder. It fprinkles to-day. 2. P. Produce of the fprinkling.

(*s*) Very hazy and foul air.

(*t*) Lightning laft night; and very foul air to-day.

(*v*) A regular northwefter laft night at 8. P. 7. P. Sprinkling rain begun. 8. P. the produce of the ftorm, which is abated: diftant thunder. 9.45 P. A very fevere ftorm juft over, which begun about 8.20. It ftill thunders.

(*w*) This was, with produce of a fmall fhower, about 10.30 P.

(*x*) The night very hot, and the air loaded with damp: the morning cool and pleafant.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	May 1785. Miſcellaneous.
1	7.40 A	29,813	47,5	84	86			SW	3		
	2.10 P	29,762	32,5	90	98,5			W	3		
	6.22 A	☽ L. Q.									
2	7.45 A	29,750	47,5	84	86	ſcattered	3	SW	4		
	2. P	29,710	38	89	98	ditto	1	SSW	3		
3	6. A	29,712	45	83,9	82			SSW	2		
	2. P	29,720	38	89	95	none		SSW	4		
4	6. A	29,735	39	83,3	82			S by W	2		
	2.20 P	29,780	36	88,5	93			SSW	4		
5	5.30 A	29,745	43	83,5	81,5	looſe	9	S by W	2		
	2. P	29,746	37	89	94	ditto	3	S by W	5		
6	5.30 A	29,808	37	82	79,5			S by W	2		(a)
	2. P	29,800	32	88	94,5	thin	2	S by W	5		
	8.45 P	29,997	28,5	82,5	78,5	thick thund.	10	NW by W	7		
	9. P	30,000	32,5	82	72	ditto	10	NW by W	3	,328	
7	5.30 A	29,840	31,5	81,5	76,5	thin	8	NNW	1		
8	6. A	29,897	40	81	81	thick	5	S by W	1		
	2.30 A	29,90	32,5	88	94	thick	3	SSW	4		
	10.25 P	☽ New									
9	5.30 A	29,875	44	81,5	80	thin	7	S	1		
	2. P	29,882	34	88	95,5	thick	6	SW by S	4		
10	7. A	29,867	41	82,7	84,6	thin	3	SW by S	3		
	2. P	29,843	32,5	88	95,5	thick	5	S by W	4		
11	7. A	29,810	40	83,3		thick & thin	10				
	2. P	29,783	31,5	89	97,5	thick ſcat.	2	SSW	4		
	7.30 P	29,744	35,5	87,5	86,7	thunder	4	SSW	3		(b)
	7.47 P	29,814		87		ditto	9	NW	5		
	7.55 P	29,814	31	87	82	thunder	9	NW	7		
	8.25 P	29,808	35	83	73	ditto	10	NW by W	2	,325	
	9. P	29,754	36	79,5	74	ditto	10	ENE	2		
12	5.40 A	29,718	41	82,5	81	thick	10	S by W	2		
	2.20 P	29,752	32	89	96			SSW	4		
13	7.30 A	29,753	42	85	85	thin	7	S	4		
	2.20 P	29,754	35,5	91,5	98,5	looſe	8	S by E	3		(c)
14	5. A	29,785	35	82	78	thick	3	N by W	1		(d)
15	5. A	29,797	39	81,9	81,3	thin		E by S	2		
	2. P	29,765	26	90,5	96		2	NE	3		
	7.10 P	29,752	24	88,7	88,3	thick thund.	9	W by S	3		(e)
16	6.15 A	29,777	34	83	82,2	thin	2	NE	1		
	8.54 A	☽ F. Q.									
	2. P	29,740	17,5	89	95,5	thick thund.	4	WNW	2		
							Carried forward,		–	,653	

(*a*) Much lightning laſt night, and a maſs in N and NW. from whence we had a blaſt of wind at 10. P. 8.45 P. Sprinkling rain begun. 9. P. Very heavy thunder; a ſmart ſhower juſt over.

(*b*) A heavy thunder maſs in NW. and much lightning, with diſtant thunder. 7.47 P. The wind juſt changed, and the maſs reached the zenith. 7.55 P. Small rain begun. 8.25 P. Heavy rain over, ſmall rain continues.

(*c*) A very oppreſſive heat to-day. The air does not carry off perſpiration, and makes the whole body clammy and comfortleſs.

(*d*) The heat produced thunder all the afternoon till near 10, with ſqualls of wind from every quarter in turn, but without rain.

(*e*) The wind ſhifted about a quarter of an hour ago.

A METEOROLOGICAL JOURNAL.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	May 1785. Miscellaneous.
								Brought forward,		0,635	
17	6.15 A	29,810	32,5	80,5	80,7	thick	7	ENE	2		
	2.15 P	29,785	25	89,5	98,5			SW by W	4		(f)
18	7.30 A	29,868	37,5	82	84,5	loofe	3	E by S	3	,057	(g)
	10.30 A	29,895	36	85,8	87,7	thunder	10	SSW	4		
	11.5 A	29,886	36	81,7	78	ditto	10	ENE	3	,558	
	2.20 P	29,813	38	85	90	thick & thin	4	SE	3		
19	7.10 A	29,850	37,0	80	78,5	ditto	5	NW by W	3	,003	(h)
	2.15 P	29,763	30	85,7	94,5	fcat. hard	2	WSW	3		
22	7.5 A	29,713	36	83,5	85,3			NE	2		(i)
	2.10 P	29,677	28	90	95,5	thick	7	E	3		
23	7.30 A	29,655	38	84	87	thin	3	NE by E	2		(k)
	2.10 P	29,613	27,5	89,3	95	thick	6	NW	3		
24	7.55 A	29,563	37	88	92			SW by S	4		
	9.22 A	☽ Full									
	2. P	29,515	22	92,3	101,0	fcattered	4	WNW	3		
	6.40 P	29,502	21	91,5	91,5	thunder	8	N	3		(l)
	6.55 P					ditto	8	SSE	5	,240	
25	7.40 A	29,563	21	81,7	80,7	thin & thick	10	S by W	3	,303	(m)
	2. P	29,573	37	90	96	ditto	10	SSW	4		
	8.50 P	29,592	33	80,5	74,8	thu. remains	10	S by E	3	,562	
26	7.50 A	29,640	37,5	81	80	thin uniform	10	E by S	3	,026	(n)
	2.40 P	29,616	35	86,5	93	thin	10	SSW	3		
27	7. A	29,650	45	84	84	thin	10	SSW	3		
28	7.30 P									,336	(o)
	11. P	29,765	40	82	76	thunder	10	W by N	4		
29	8.30 A	29,742	38	84	86,5	fcattered	2	SSW	3	,082	
	2.23 P	29,696	39	88,3	92,5	thick	7	SSW	5		
	8.10 P	29,703	43,5	86	86	thunder	10	S	0		
	8.25 P	29,757	43,5	86	86	ditto	10	N by E	1		
30	6.40 A	29,710	47	84	83,5	thin & thick	5	SW by W	2	,173	
	10.40 P	29,663	44	86,5	85,5	thunder	10	SSW	3		(p)
31	7.40 A	29,641	46,	86,3	80	ditto	10	ESE	2	,697	(q)
	11.57 A	☽ L.Q.									
	2.20 P	29,590	44	87	93	thick	7	SW	3		
								TOTAL IN MAY,	–	3,690	

(f) The clouds were 6 about 10, but are all gone.

(g) A fmall thunder fhower at 7. P. yielded the water. It came from ENE. 10.30 A. A thunder fhower juft over of about ten minutes duration. 11.5 A. A very heavy thunder ftorm juft over: it began immediately after laft obfervation.

(h) We had another ftorm in the night, with a fprinkling of rain.

(i) We had a mafs of thunder clouds from NNW laft night, without rain. 2.10 P. The heat very oppreffive.

(k) We were almoft fuffocated laft night. I could not clofe my eyes till paft 4.

(l) It rains, and there has been diftant thunder. 6.55 P. Thunder clofe and loud; heavy rain.

(m) Between 11 and 12 the ftorm came on again heavier than before. 2. P. The air does not carry off perfpiration, and therefore leaves the body clammy. 8.50 P. At 7 we had a moft furious ftorm from N 8: a torrent of rain, but of fhort duration; and all has been quiet this hour.

(n) After laft obfervation, it began to rain fmall rain, which contined fome time.

(o) We had in town a very violent northwefter, and it reached the gardens, where it produced this rain. 1.11 P. The day has been hot, and the fky covered with thin clouds; fince 8 they have collected, and we had much lightning in the WNW. and now the ftorm has reached us.

(p) Much lightning in the NNE. and diftant thunder.

(q) It fprinkled rain foon after laft obfervation, but at 5. A. we had a tremendous thunder-ftorm.

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Day	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	April 1785. Miſcellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
1	7.10 A	29,570	47	84	86,5	thunder	5	SSW	3		(a)
	2.30 P	29,525	37	89	103,0			SSW	3		
	8.40 P	29,612	41	88,5	88	thunder	10	WNW	5		
	9.15 P	29,637	38	85,2	77	ditto	10	SW$\frac{1}{2}$W	4		
2	7. A	29,585	45	84	85	thick	8	S by E	3	,665	(b)
	2.20 P	29,590	42	84	88	ditto	10	S by E	3		
3	6.40 A	29,565	46	82	83	thin	3	SE	3		
4										,168	(c)
5										,154	(d)
6	8. A	29,592	48	84	87	thick	6	ESE	2		(e)
	7.38 A	☽ New									
7	8.20 A	29,616	51	83	84,5	thunder	10	SSE	3	,100	(f)
8	8.20 A	29,621	52	83		thick	10	SE by S	4		
	2.20 P	29.580	48	83,5	88	ditto	10	S by E	3	,503	(g)
9	8.40 A	29,657	47,5	80	77	thick looſe thun.	10	SSW	3	,700	(h)
	1.50 P	29,625	50	81	79,5	ditto	10	SSE	4	,469	
10	8.15 A	29,655	55	83	87	thick ſcat. looſe	5	S by E	4		
	2.15 P	29,617	52,5	83,5	86	ditto	10	S by W	4	,036	(i)
11	7.30 A	29,655	57,5	83	88,5	ſcattered	4	S by E	3	,056	(k)
	2.20 P	29,633	48,5	88	95	ditto	6	S by E	4		
12	7.30 A	29,653	53,0	84	87,5	looſe	7	S by E	4		
	2.23 P	29.580	45,0	86	96	ditto	5	S	4		
13	5.35 A	29.593	54	83	82	thin	5	S	2		
14	5 25 A	29,500	50	83	81,5	ditto	5	S	2	,478	(l)
	2.28 A	☽ F.Q.									
15	7.25 A	29,420	51	83,5	82,5	thick & thin	9	NW	3	,006	(m)
	2.20 P	29,367	53	82,5	80,5	thick	10	NW	4	1,317	
16	7.40 A	29,472	52,5	80,5	78	thick looſe	10	WSW	3	1,700	(n)
	2.15 P	29,450	53	83	87	thick	10	SW by S	3	,188	
17	6.15 A	29,504	55	80	78	ditto	10	SW by S	3	,477	(o)
18	6.35 A									1,736	(p)
	8.15 A	29,630	55	79	75,8	thick looſe	10	S by E	3	,200	
	2.15 P	29,581	55	82,5	85	thick	10	S by E	3	,150	
								Carried forward,	–	10,104	

(a) There was a great deal of thunder laſt night. About 2 it was moſt oppreſſively ſultry, being a dead calm. 8.40 P. After exceſſive lightning in the NW. the maſs has reached us, and the ſtorm is begun. 9.15 P. It ſtill rains ſmartly: the thunder now approaches, but is very far off. This looks more like the rains than any thing we have yet had; and if the wind veer to the ſouth we may reaſonably expect them.

(b) Produce of laſt night's ſtorm. (c) Produce of a thunder-ſtorm at noon. (d) Do. and at noon alſo.

(e) There was a ſtorm at noon, and at dinner time, and the evening was fine.

(f) It has rained this morning with thunder; this water is yeſterday's and to day's.

(g) We had rain yeſterday, and twice to-day, and this is the produce of all.

(h) It began to blow and thunder and lighten at 12,,30, and before 1. A. we had a heavy ſhower. Ever ſince it has rained more or leſs, with much thunder. 1.50 P. It has rained without ceaſing, more or leſs, ever ſince morning.

(i) We have had a thunder ſhower from SW. (k) There was a ſhower at day-break.

(l) At 6.P. yeſterday a heavy ſhower from NW gave this water: and there was only a ſprinkling in town.

(m) There was a ſmall ſhower about 3, and another about 9 P. 2.20 P. Heavy ſhowers began about 9, and ſtill continue with ſhort intervals.

(n) It has rained ever ſince laſt obſervation; at times only ſprinkling, at others ſmartly; and now moderately. 2 15 P. The rain abated gradually, and ceaſed before noon.

(o) At 9 P. a thunder ſtorm from the W. brought on rain again, and it continued till morning.

(p) It was running out through the air-hole. How long it had done ſo I cannot tell; but it rained all day yeſterday: drizzling and at times barely perceptible; heavily about 6 P. and drizzling till near day; then hard again; and now it rains ſmartly, as it did when the water was meaſured, and there is ſome in the meaſure beſides. 2.15 P. The rain ceaſed about 10, and the ſun ſhone at noon.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	June 1785. Miscellaneous.
								Brought forward,		10,104	
19	8. A	29,558	58	81,5	84,3	fcattered	6	SSW	2	,375	(q)
	2.20 P	29,528	52	83	82,8	thick	10	W½N	2	,156	
20	8. A	29,567	50	81,5	84,5	thin & thick	7	SSW	3	,004	(r)
	2.10 P	29,520	50	81,3	84,5	ditto	6	S½E	4	,332	
21	7.35 A	29,549	53	80	78,5	loofe low thick	10	S½W	2	,132	(s)
	2.15 P	29,522	48	83	89,7	fcattered	5	SW by S	4	,001	
22	7.25 A	29,552	53	81,5	81,5	thick	10	W	2	,007	(t)
	8-11 A	☽ Full									
	2.25 P	29,525	51,5	83	90,5	thick fcat.	7	S by W	2		
23	8.50 A	29,539	55	82	79,5	loofe	10	NW	1	3,250	(v)
	2.20 P	29,521	56,5	82	82,8	loofe	10	S	3	,076	
	6.20 P	29,498	56			thick	10	S by E			
	6.55 P	29,516	56	83		thick loofe low	10	S by E			
24	6.20 A	29,510	58,5	81,5	81,5	thin	10	SE	3	1,778	(w)
	11.45 P	29,524	58	82	81	thick fcat.	8	SE	3	,068	
25	7.20 A	29,512	59	83	84,5	thick	8	ESE	4		
	2.40 P	29,472	53	83	92,5	thick fcat.	5	SSW	2		
26	7.35 A	29,508	56,5	83,5	83,5	thick	7	WNW	2	,073	(x)
	2. P	29,482	52,5	84	87	thick	9	SW	2		
	6.20 P	29,471	56	83	83,5	thick	5	SW by S	3	,507	
27	7.15 A	29,490	59,5	84	84,5	thick low	10	SSW½W	3		(y)
28	9. A	29,472	57	81,5	79,5	thick low loofe	10	SE	3	1,000	(z)
	2.15 P	29,428	58,5	83,5	87,5	thick low	10	SW by W	3	,367	
29	7.20 A	29,446	56,5	83	86	thick loofe gat.		S by W			(aa)
	2.25 P	29,406	51,5	85	91	thick	6	S by W½W	3		
	4-21 P	☽ L. Q.					9		3		
30	7. A	29,224	50,5	83	82	thick	8	S½W	3	,169	(bb)
										,213	
										18,611	
										7,450	(cc)
								TOTAL IN JUNE,	-	26,061	

(q) Between 10 and 11 P. there was a heavy fhower, that produced 2 of this quantity; the reft fell this morning. 2.20 P. A fhower juft over.

(r) This was the end of the laft fhower. 2.10 P. A heavy fhower about 11 o'clock in the forenoon.

(s) Mifty rain. 2.15 P. It cleared foon after laft obfervation.

(t) A fhower about 4 o'clock this morning.

(v) About 1 it began to rain in torrents. At ½ paft three 2 inches were meafured. At 6½ this morning a third; the reft fell fince, and it ftill fprinkles. There was exceffively heavy thunder, with moft vivid lightning, at 3, though but little wind. 2.20 P. Drizzling rain all day. 6.55 P. A fprinkling about 6.35. Diftant thunder.

(w) Soon after laft obfervation it began to drizzle, and the mercury rofe, but in a fhort time after fell again. The rain continued till 1 in the morning, and for about two hours was very heavy. 11.45 P. This fell in the courfe of the day, about 9 and again 2. P.

(x) A fmall fhower at 7. P. yefterday, and another juft over. 2. P. A fhower in the forenoon. 6.20 P. A fhower about 5. P. and the above produced this water.

(y) The night was clear, and ftars bright.

(z) It was very gloomy at 9, with much lightning. About midnight it began to rain; towards morning more, and at 6. A. heavily, and ever fince fmartly, and fo it ftill rains. 2.15 P. It rained till near noon, and is about to rain more.

(aa) The morning has been bright.

(bb) The rain fell about 8. P. laft night in a fmart fhower from SW wind 5. ,213 This rain fell about 6 P. and was heavy for the time it lafted.

(cc) Add this for the overflowing on the 10, 18, 23 and 24, when the garden was all under water.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	July 1785. Miſcellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
1	2.50 P	29,436	53	85	92	thick	4	E½N	3		
2	7. A	29,483	55,5	83	85	thick	6	E½N	4	,148	(a)
	0.10 P	29,510	47,5	83	84	thick looſe low	10	ESE	5		
3	9.20 A	29,512	55,5	83	84	thick looſe	6	E½N	6	,300	(b)
	2.20 P	29,480	55,5	83,3	85	ditto	7	S by E	4	,450	
4	8.12 P	29,556	54,5	82	84	thick	10	SW	4	,069	(c)
5	9.30 A	29,586	56,5	83	81,5	thick looſe	10	WNW	3	,900	(d)
	2.30 P	29,528	56	82	83	thick hard	10	SW by S	2	,017	
6	6-22 A	☽ New									
	7.10	29,486	57	81	78,5	thick looſe	10	NW	2	,923	(e)
	2.45 P	29,415	58	82	80,5	looſe	10	SW by S	3	,150	
	7. P					ditto	10	SW	7	,500	
7	6.40 A	29,40	58	81	78,7	ditto	9	SW½S	3	,359	(f)
9										,300	(g)
										,186	
	8. A	29,60	61	82	84	thin	6	SE	2		
10	7. A	29,654	62	82	83,5	thick thun. col.	5	S	4		
	0.15 P				94	ditto	7	S	4		
	2. P	29,610	62	83,5	88,7	thick thund.	8	SSE	4		(h)
11	7.30 A	29,662	59	83	88	thick ſcat.	8	S½E	2		(i)
12	2.30 P	29,556	56	83,5	90,7	thick	10	SW by S	3	,036	(k)
13	7.30 A	29,516	58	83	82	looſe	10	SW by S	2	1,500	(l)
	2.30 P	29,460	58	83	86	thick	10	SSW	3	1,223	
14	6.40 A	29,944	55	81,3	80,7	thick	10	S by W	3	,016	(m)
	7-28 A	☽ F.Q.									
								Carried forward,	–	7,077	

(*a*) The night very cloſe and ſuffocating. After 3 in the morning, thunder and lightning, and a little wind with rain made it poſſible to ſleep. 0.10 P. A heavy ſtorm came on, the wind was NE the greateſt part of the forenoon, now has changed.

(*b*) It rained all the afternoon, and till near 8. P, and is about to rain again. 2.20 P. Flying ſhowers, five or ſix ſince laſt obſervation.

(*c*) The produce of ſeveral drizzling flying ſhowers after laſt obſervation.

(*d*) About 6 it began to rain, and there were ,400 at nine. It has rained almoſt all night, and there were ,500 drawn off juſt now; it ſtill drizzles. The lightning fell cloſe to the bazar, that is about $\frac{1}{3}$ of a mile from the houſe, but did not hurt any body.

(*e*) Rain in the night with lightning. Heavy rain about day-break, and the ſhower but juſt over. 2.45 P. Showers all the forenoon, and now ſet in. 7. P. It has been a very rainy, windy afternoon, and it ſtill continues ſo.

(*f*) It has been tempeſtuous at times, and rained in flying ſhowers all night.

(*g*) The 7th in the evening. ,186 The 8. to 2. P. when it ceaſed.

(*h*) It has thundered at a diſtance.

(*i*) There was lightning about 10. P. but not any rain.

(*k*) This rain fell yeſterday about 4. P. It has not rained ſince.

(*l*) It rained heavily laſt night about 11, and it has juſt begun again gently. 2.30 P. The rain continued till paſt one.

(*m*) The rain fell in the evening about 6.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	July 1785. Miscellaneous.
				In.	Out.	Kinds.	Quant.	Quarter.	Force.		
								Brought forward,		7,077	
15	8.40 P	29.660	58,5	83	87	thick	9	SW	4	,072	(n)
16	2.40 P	29,586	54	85	91	thick	10	SW by W	3		
17	0.45 P	29,553	55	85	92	thick	7	SW by W	3	,184	(o)
18	2.20 P	29,442	54	83,3	85	thick	10	WSW	5	,340	(p)
19	7.20 A	29,468	57	81	78	thick loofe	10	SW by W	3	,291	(q)
21	10.20 P	29,596	60	83	82,5	thin	5	S½E	3	,430	(r)
22	5-20 A	☽ Full									
	6.15 A	29,586	64	82	81	thick loofe fog.	9	S	2		
24	7. A	29.682	61	80,9	81	thick	9	E by N	4	,110	(s)
	2.20 P	29,650	55	84	90	thick	3	ENE	2	,014	
25	5.45 A	29,675	58,5	81	80	thick	3	SSE	2		
26	8.50 A	29,686	54	84	87,5	thick & thin	8	SSW	2		
	2.30 P	29,627	51	85,6	91,5	thick	9	SE by S	3		(t)
	8.25 P	29,636	54	84	80	thick	8	NW by N	2	1,700	
27	7.20 A	29,641	56,5	83	87	thick	5	S	1	0,007	(v)
	2.20 P	29,613	52,5	84	89,5	thunder	10	SE	4	,025	
28	6.30 A	29,612	58,5	82	84,5	loofe	3	S by E	2		
	9-11 A	☽ L.Q.									
29	1.20 P	29,562	52,5	86	91.5	thick	8	ENE	3		
30	8.10 A	29,580	56,5	83,9	87	thick	9	SSE	2		
	2.40 P	29,512	51,5	86,5	93	thick	8	S by W	3		
31	7.15 A	29,528	56	82,3	80,7	thick	9	NE½E	3		
	2. P	29,370	58,5	80	79	thick	10	S	4	,226	(w)
										,016	(x)
										10,392	
								Overflowing,		1,700	(y)
										12,092	
								TOTAL IN JULY,		12,192	

(n) This rain fell the 14th in the night, and not any fince.
(o) Rain yefterday evening, and in the night before 3 o'clock.
(p) A very tempeftuous night, and rain to day alfo.
(q) Sprinkling rain.
(r) ,4 fell on the 19th, the reft yefterday. Not any to-day. The forenoon was foggy and cloudy, very clofe and hot.
(s) This fell the day before yefterday. 2.20 P. A thunder fhower at 11. Exceffively high tide to-day.
(t) A fhower juft come on. 8.25 P. Two very heavy fhowers fince 7. P. about which time it began with very heavy thunder from SE, and varied to NW.
(v) The remainder of laft night's ftorm, which was over when the laft obfervation was entered. 2.20 P. A thunder fhower about 12, and it now thunders, and more is coming on.
(w) It rains hard. The wind has veered all round the compafs at leaft twice fince morning, with flying fhower of fmall rain and diftant thunder, of deep and heavy found.
(x) The wind increafed to 8, and blew fo for above an hour with rain, of which this is the produce.
(y) Add this for overflowing on the 26th, and it could not be lefs.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	August 1785. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
1	6. A	29,490	60	81	79,3	thick	3	S by E	3		
2	6.10 A	29,515	62	81,7	81,3	thin & thick	4	SSW	2	0,005	(a)
	2. P	29,515	57	83,2	88,7	thick thund.	9	SE by S	3		
3	5.40 A	29,561	65	81,5	81,5	thin	2	S by E	2	,715	(b)
	11. A										
4	8. P.	29,544	57	83	83	thick	5	SE by E	2		(c)
5	7-26 A	☽ New									
	11. P	29,578	60	82,2	80,9	thin	6	SE	2	,719	(d)
6	6.30 A	29,528	64,5	80,9	80,9	thick	9	E by N	2		
	11. P	29,588	62	82,3	80,3	thin	5	SW by S	2	,271	(e)
7	8.30 A	29,580	63	82,3	83	thick	10	W by N	2		
	2.15 P	29,520	61,5	83,7	90,2	thick	9	SSE½E	3	,066	(f)
	11. P	29,600	64	83,5	81	thick	10	S by W	2	1,000	
8	6. A	29,592	62	80,5	78,5	thick	10	S½W	2	,546	(g)
9	7.50 A	29,750	63,5	80	79	thick	10	SW	2		(h)
	0.50 P	29,735	64	80	86	thick hard	8	S	2	,293	
10	6.20 A	29,700	64,5	80,5	81	thick	3	S by E	2		
	1.15 P	29,66	58,5	84,3	90,3	thick thund.	6	SSW	3		
11	9. A	29,638	67,5	83	86,3	thick	5	SSW	3		
	2.15 P	29,574	61,5	86	92,5	thunder	7	S by W	3		
12	7.50 A	29,608	66,5	83,6	87,3	thick	8	S½E	2		
	2.15 P	29,564	56	86,5	91,5	thunder	10	S½W	2	,070	(i)
13	7. A	29,606	65	81,5	82,2	thick	9	WNW	3	,014	(k)
	11-24 A	☽ F. Q.									
	2.15 P	29,550	63,5	82,8	86,5	thick thund.	10	S by E	2	,400	
14	7.45 A	29,544	64	81,5	82	thick	10	NW	2	,196	(l)
	2.20 P	29,466	67	84,5	89,5	thick	8	E½N	1		
15	7.45 A	29,498	65	82,7	84	thick	6	SSE	3		
	2. P	29,468	61,5	83,5	86	thick thund.	10	E by N	2	,143	(m)
16	7.45 A	29,528	65	82,8	83,2	thick	5	NE½E	3		
	2.15 P	29,460	57,5	85	87,3	thunder	10	NNE	4		(n)
17	7. A	29,472	64	81	80,2	thick loofe	10	NE	2	,475	(o)
	2.10 P	29,493	61,5	84,5	88,2	thick	8	SW by S	5	,025	
18	6.15 A	29,580	63	80,5	78,5	loofe	10	S	3	,583	(p)
						Carried forward,			–	5,521	

(a) About one P. it rained very heavily in town; and very little here: the quantity is noted. 2. P. Diftant thunder.

(b) This fell in a very fhort time. In town there was only a fprinkling.

(c) It was very gloomy in town all the forenoon; and we had two fmall fhowers, but not any at the gardens.

(d) Of the water 5 fell laft night, the reft in the forenoon to-day.

(e) It rained almoft the whole day fmall rain.

(f) Rain in the forenoon. 11. P. And ftill raining hard.

(g) It has rained almoft inceffantly all night long; and ftill rains, though it is going off.

(h) It rains very heavily. The mercury is in a falling ftate, fo that it has been higher.

(i) This fell in the night about 15. P. and we have had a fprinkling about 11 this forenoon befides.

(k) This fell about 2 in the morning, with a guft of of wind and fome lightning. 2.15 P. Two or three thunder fhowers fince 9; and it now thunders.

(l) Yefterday afternoon and in the night it rained.

(m) 2. P. Several fmall fhowers with thunder.

(n) 2.15 P. Thunder at a diftance.

(o) Thunder fhowers yefterday afternoon, and in the night, and rain this morning. 2.10 P. Showers all the forenoon of very fmall rain, and fhort duration.

(p) It has been a very tempeftuous night, with frequent fhowers. It ftill rains, and the wind was in general 6 and 7 in the night.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	August 1785. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
								Brought forward,		5,521	
19	6.50 A	29,578	67	83	84	ſcattered	5	SSW	4	,142	(*q*)
	2.30 P	29,564	49	88	90,5	thick	5	SW by W	2		
20	7. A	29,580	63	83	85	thin	9	SW by S	3		
	1.41 P	☽ Full									
	2.20 P	29,566	40	90	93	thick	4	SW by W	4		
21	6.10 A	29,576	54	83	80	thick	5	N	1		
	1. P	29,625	52,5	85	85	thunder	10	NE by E	3		(*r*)
	2.15 P	29,578	54	84	83	ditto	10	ESE	2	,015	
22	6. A	29,588	58	83	81	thick	9	W by N	1		
	2.15 P	29,556	54	85	90	thick	8	NE by N	4	,052	(*s*)
23	6.30 A	29,570	61	83	81	thick thund.	9	N	1	,248	(*t*)
	2.15 P	29,576	59	83,5	86,8	thick	8	S½E	5	,053	
24	7. A	29,596	60	82	82	thick	7	E by S	3	,030	
	2.15 P	29,598	59,5	84	86	thunder	9	S by E	3	,084	(*v*)
25	6.30 A	29,646	62	82,5	81,5	thick & thin	9	S by E	2		
	2.15 P	29,640	55	85	86,5	thick	9	SSW	2		
26	7. A	29,690	61	82,8	83	thin	9	ESE	2		
	2.15 P	29,642	58	84	81,9	thunder	9	S½E	2	,186	
27	4.03 A	☽ L.Q.									
	6.15 A	29,700	61	82,5	80	thin & thick	7	SSE	3	,017	(*w*)
	2.25 P	29,688	57,5	84,5	88,9	thick	9	S by E	3	,004	
28	7. A	29,758	61	82,0	80,9	looſe	10	SE by E	2	,200	(*x*)
29	7. A	29,696	61	81,8	81,8	thick	6	S by E	2	,214	(*y*)
30	7.10 A	29,704	63	83	83,2	thin	10	SW by S	2	,055	(*z*)
	2.35 P	29,628	58	85,4	88,5	thunder	9	S by W	2		
31	5.30 A	29,610	61	82	80,7	thick looſe	10	WNW	1		
	2.25 P	29,600	63	82,5	81	thunder looſe	10	WSW	2	1,707	(*aa*)
								Overflow.		1,700	(*bb*)
	7. P									,338	(*cc*)
								TOTAL IN AUGUST,	–	10,661	

(*q*) Rain about noon yeſterday, and after it; and the concluſion of the ſhower yeſterday morning.

(*r*) 1. P. Thunder at a diſtance; ſprinkling rain began. 2.15 P. Thunder over.

(*s*) 2.15 P. Rain about 8 A.

(*t*) Thunder ſhowers ſince laſt obſervation. 2.15 P. Several ſhowers of ſhort duration ſince laſt obſervation. Tides high.

(*v*) 2.15 P. Several ſmall ſhowers with thunder.

(*w*) Rain with thunder yeſterday afternoon. 2.25 P. A ſmall ſhower juſt over.

(*x*) Rain now falling, and ſome fell in the afternoon yeſterday.

(*y*) Rain yeſterday before ſun-ſet.

(*z*) Rain in the night. 2.35 P. It has thundered this forenoon; and being then dead calm, the heat was almoſt inſupportable. 2.25 P. The gage ciſtern holds only that quantity; how much fell I know not, but I think as much more.

(*aa*) The water meaſured to-day fell in about an hour. To-day I meaſured the ciſtern, and it holds only 1,707; and through the air-hole there runs out one-tenth in 40″. It is impoſſible, therefore, to aſcertain what did fall to-day; but that it had run out was evident; and from circumſtances I judge the quantity was as much as was meaſured.

(*bb*) Add 1,700, it could not be leſs, as there was a great deal of water in the garden: and beſides, I know from a canal that its water roſe 3,4. Yeſterday it was 1,5 below the drain; this afternoon the water ran through the drain two inches deep, and yet only three-tenths of rain fell in the afternoon.

(*cc*) This fell in the afternoon.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Sept. 1785. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
1	5.30 A	29,60	68	81,5	80	thick	5	S by W	2		
2	7.40 A	29,70	66,5	82	82,5	thick	5	S	3	,052	(*a*)
	2.30 P	29,67	68	83,5	85	thick	10	SSE	3	,156	
3	5.30 A	29,712	71	81,5	79,9	thick	3	SSE	1		
	2.20 P	29,700	65	83	86	thick	6	S by W½W	3		
	10.51 P	☽ New									
4	6. A	29,748	69	82	79,9	thin	5	S by W	1		
	2.20 P	29,730	50,5	85	92	thick	6	S by W	2		
6	6.15 A	29,772	55,5	83,5	82	thick fcatter.	6	SSW	2		
	2.25 P	29,734	46,5	88	91	thunder	7	SW by W	4		(*b*)
7	5.40 A	29,720	55	84	82,2	thin & thick	6	SSW	3		
	2.30 P	29,714	45	87,5	89	thunder	9	SSW	3		(*c*)
8	5.40 A	29,716	55	84	81	thin	3	S by W	2		(*d*)
9	5.40 A	29,740	55	83	82	thin	3	S½W	1		
	2.10 P	29,730	45	87,5	92	thunder	5	SW by W	2		(*e*)
10	7.30 A	29,820	54	84,8	85	thin & thick	6	S by E	2		(*f*)
	2.25 P	29,784	48	88	92	thunder	9	SSW	3		
11	7. A	29,782	55,5	83	81,5	thick	9	N by E½N	2		
	2. P	29,754	50,5	86	88,5	thunder	10	SW by S	3		(*g*)
12	1.55 A	☽ F. Q.									
	6.10 A	29,720	55	83,5	80,2	thunder	6	SW½S	2	,582	(*h*)
	2.10 P	29,668	53,5	86	92	thick	9	S	2	,185	
13	5.55 A	29,650	57	84	82	thick	7	S by W	2		(*i*)
	1.20 P	29,592	55	87	93	thick heavy	9	SSE	2		
14	7.10 A	29,655	56,5	83,3	81,9	foggy	10	ESE	2	,010	(*k*)
	2.10 P	29,608	52	86	89,5	thunder	8	SE by S	4	,002	
15	5.50 A	29,600	56,5	82	80	loofe	7	E by N	3	,001	(*l*)
16	7.15 A	29,648	56,5	82	81	thin	4	E by S½S	3	,128	(*m*)
	2. P	29,616	54	84	86	thunder	5	E½S	2	,590	
	8.40 P	29,659		83	82	thin	5	SE by E	3	,110	
17	6. A	29,630	59	82	80	thin	9	SE by E	2	,003	(*n*)
	2.25 P	29,628	54	85	82,5	thick	10	E by N½N	1	,001	
								Carried forward,	–	1,820	

(*a*) A fhower about 1 in the morning, with violent wind. 2.30 P. A fhower about 10.

(*b*) Diftant thunder.

(*c*) 2.30 P. We had a fprinkling of rain at 11, and fome thunder fince.

(*d*) Yefterday it rained hard at *Dumdum*, and to-day there was a very fmart fhower in *Calcutta*; only a fprinkling here.

(*e*) 2.10 P. Diftant thunder, but approaching from the SW to SSE.

(*f*) About and until fun-fet we had a double rainbow, but the rain was only in fcattered drops.

(*g*) 2. P. Loud thunder in the NE.

(*h*) At ½ paft 4 we had heavy rain from the SW. with lightning. 2.10 P. Rain about 9 o'clock.

(*i*) A fprinkling juft over.

(*k*) We had a great deal of thunder laft night, fprinkling rain and dead calm till day-break. 2.10 P. We had two or three fprinklings, and fome thunder.

(*l*) A fprinkling in the afternoon about 3. P.

(*m*) This water fell yefterday, and it did not rain in town. 2. P. At ½ paft 12 a very heavy fhower gave this water in lefs than 20 from SE 5. 8.40 P. This water fell about fun-fet, from which time the fky began to clear.

(*n*) This fell in the night. 2.25 P. A fprinkling in the forenoon.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Sept. 1785. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
								Brought forward,		1,820	
18	6. A	29,648	58	81	80,5	loofe	8	E by N½N	2		
	7. A	29,664	58	81	80	loofe	10	ditto	2		(o)
	2.20 P	29,613	56	84	85	loofe	10	S by E	3	,056	
	9.57 P	☽ Full									
19	6. A	29,590	59	81	80	thick loofe	10	E by S	2	,003	(p)
	2.15 P	29,588	61	83	87,2	thick heavy	10	S by W	2	,002	
20	6. A	29,580	62	81	80	thick loofe	10	SE	2	,281	(q)
	2. P	29,576	59	84,5	89	thick	8	S by E	3	,163	
21	7.50 A	29,687	61	81	81,5	thick	9	E by S	4	,387	(r)
	2.25 P	29,666	60,5	84,3	87	thick	10	SE by S	4	,084	
22	6. A	29,754	62	81	79,8	thick	3	E by N	4	,016	(s)
23	7. A	29,756	62	80	80,8	thin	4	NE	1	,270	
	1.30 P	29,728	58	84,7	88,8	thick	6	NW	1		(t)
24	8.15 A	29,723	62	83	84,5	thick	9	NW	3		
	2.15 P	29,636	55	86	89,5	thick	8	NNW	3		
25	8.50 A	29,668	58	83	84	thick	5	E by S	4		(v)
	2.15 P	29,583	53	84,3	86	thick	7	ESE	4	,154	
	2.21 P	☽ L.Q.									
26	8. A	29,666	58	80,8		thick loofe	5	ENE	3	,395	(w)
	2. P	29,608	58	82	84	thick	9	SSE varying to S by W	5	,291	
27	7.45 A	29,641	61	81	81,8	thin	5	SE	3	,018	(x)
	2.25 P	29,573	59	82	81	thick	10	SW	3	,130	
28	7.20 A	29,600	60	81	81	thick	9	SE by S	5	,130	(y)
	2.15 P	29,556	62	83	85,5	thick	10	SSE	5	,009	
29	6.30 A	29,638	63	81	79,5	thick	10	S by E	2	2,640	(z)
30	6.30 A	29,680	61	78,2	79,9	thick hard	4	SW½W	3	,182	(aa)
	12. P									,001	
								TOTAL IN SEPTEMBER,	-	7,032	

(o) 7. A. A fmall rain. 2.20 P. Rain in the forenoon, feveral fmall fhowers.

(p) This fell yefterday before fun-fet. 2.15 P. Rain in a fhort fprinkling this forenoon.

(q) Rain yefterday evening, and in the night: it ftill rains fcattered large drops. 2. P. Rain in the forenoon.

(r) Rain with thunder at 5. P. again in the night twice, and fince day alfo. 2.25. P. Two or three fhowers fince laft obfervation.

(s) Rain in the afternoon yefterday. Rain twice to-day.

(t) 1.30 P. The wind has varied round and round, though hardly perceptible.

(v) The night was dead calm till about an hour before dawn, and then we had a ftorm from the NE. with lightning. 2.15 P. A fhower juft over.

(w) Rain at 4. A. and again at fun-rife. 2. P. Flying fhowers all the forenoon.

(x) Rain yefterday afternoon. 2.25. P. Several fmart fhowers fince laft obfervation.

(y) A very ftormy night, with frequent fhowers. 2.15 P. Two or three fhowers fince morning, but all momentary, and fmall.

(z) Before 11 o'clock P. we had rain 15. Between 12 and 1 there came on a violent rain, attended with thunder, lightning, and wind, which varied round and round; it produced 1,25; before three 1,20, and the reft fince. It ftill lowers, and threatens.

(aa) Several fhowers yefterday, and one in the night. 12. P. A fprinkling to-day.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Oct. 1785. Miſcellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
1	8. A	29,826	58,5	81,2	81,5	thin	4	WNW	2		
	2.10 P	29,770	50	84	87,5	thin	2	W by S	3		
2	7.45 A	29,840	56,5	80,5	80,5			SW½S	2		
	2.20 P	29,797	37	83	86			WNW	3		
3	6.15 A	29,790	53	80,5	82	thin	7	SW by S	2		
	3.54 P	☽ New									
	5.30 P	29,764	46	84	84,5	thunder	5	WNW	3		(a)
4	7.15 A	29,845	54	81	80	thick ſcat.	4	NW	2		
	2.20 P	29,824	49	84,3	87,3	thick	6	WNW	2		(b)
5	7.30 A	29,875	54	82	81,5	thin	2	SE by S			
	2.15 P	29,833	43	86	90,5	thick	6	SSW	2		
6	6.50 A	29,910	52	82	79	thin	1	S	1		
7	6. A				78,5						
	7.40 A	29,872	51	82	81,5			SW			
	2.30 P	29,790	45	86	89,5	thick	6	WNW	2		
8	7.15 A	29,858	50	81	78	thunder	8	E½N	1	,331	(c)
	2.30 P	29,773	45	85	88,5	thick thund.	8	NE	2		
9	6. A	29,86	52	80,5	78	thick	3	NE	2	,335	(d)
	2.25 P	29,799	50	81,7	87,5	thunder	9	S by E	3	,268	
	10.30 P									,455	
10	5.35 A	29,873	55	78,2	75,5	thick	4	ENE	2	,002	(e)
11	6.15 A	29.907	56	80,5	78,6	thick ſcat.	7	E	2		
	2.20 P	29,863	52	84	88,5	thick	6	NNE	3		
	2.46 P	☽ Firſt									
12	7.15 A	29,902	55	81,2	81	thin	2	W½N	1		(f)
	2.25 P	29,868	47	84,3	87,5	thick	6	NW	1		
13	6.30 A	29,900	53	81,5	79	thin	2	NW½W	2		
14	7. A	29,894	53	81,5	80			W by S	2		
	2.20 P	29,848	46	84	88,9	thick	8	WNW	2		
15	7. A	29,892	53	82	79,9	thunder	3	NW by W	2		(g)
	2.15 P	29,878	45	86	89	thick thund.	6	NW½N	3		
16	6.45 A	29,848	52	81,5	80	thin	4	N	2		
	2.25 P	29,897	46	86	88,5	thick	6	N	3		
								Carried forward, –		1,391	

(a) 5.30 P. Rain in the North.

(b) 2.20 P. Very ſultry.

(c) There was much lightning in the North, with diſtant thunder, and at 4 we had a thunder ſhower.

(d) A thunder ſhower about ſun-ſet. 2.25 P. Rain began at 3, and continued till near 9; it came from the NE. with a very ſudden change.

(e) Whether this was rain or dew I do not know.

(f) At 6.30 A. The thermometer out of doors 78,7.

(g) Thunder at a diſtance twice this morning.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Oct. 1785. Miſcellaneous
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
								Brought forward,		1,391	
17	6.20 A	29,928	50	80,7	78,2			N by E½E	2		
	2.5 P	29,885	42,5	85	86,5			N	4		(b)
18	6.46 A	☽ Full									
	6.50 A	29,914		79				N	1		(i)
	2.30 P	29,878		86				N	3		
19	6.30 A	29,872		79				NNE	2		
	2.30 P	29,856		86				N	1		
20	7.30 A	29,900		80		thick	10	N	2		(k)
	2. P	29,832		86		thin	5	N	2		
21	8. A	29,92		81,7		thin	3	N Eaſtly	3		
	2.30 P	29,864		87,5		thick & ſcat.	5	N	4		
22	6.20 A	29,884		78				N	3		
	2.40 P	29,828		87				NNE	4		
23	6.20 A	29,892		77,5		thin	4	N	3		
	2. P	29,864		87		thin	3	NE	3		
24	7.10 A	29,936		79,5		thin	6	NNE	2		
	2. P	29,903		85,5		thin	4	NNE	2		
25	4.45 A	☽ L.Q.									
	6.30	29,913		78,5		thin	4	NE	9		
	2.10 P	29,900		88		thick ſcat.	3	N	2		
26	6.40 A	29,874		80,5		thick & thin	4	NE	2		(l)
	1. P	29,860		88		thunder	8	SE	1		
	1.25 P	29,866		86		thunder	9	SE	4		
	1.40 P					thunder	10	SE	6		
27	7. A	29,840		78,5		thick looſe	10	NNE	1	,920	(m)
	2. P	29,780		83		thick	10	NE	2	,456	
28	7. A	29,724		77		looſe foggy	9	NNE	3		
30										,084	(n)
31										,012	(o)
								TOTAL IN OCTOBER,	–	2,863	

(b) 2.5 P. Quitted the gardens this evening.

(i) Firſt obſervation in *Calcutta*.

(k) The clouds began to collect yeſterday about 9 A.

(l) Foggy. 1 P. Diſtant thunder. 1.25 P. Do. and rain coming on. 1.40 P. Rain began in large drops.

(m) The rain fell heavily, and continued till about three, and produced the water above at the gardens. It has rained in the night, and I heard it at day-break, and it drizzles now 2 P. Smart rain. This water was meaſured in the morning.

(n) Rain at day-break.

(o) Rain at noon.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Nov. 1785. Miſcellaneous.
2	7.15 A	29,947		80		thick	4	N	1		
	9.33 A	☽ New									
	2.30 P	29,912		85,5		thick	8	ESE	3		
3	8.30 A	29,964		80				N	2	,003	(a)
4	8.15 A	29,936		79,3		thick	6	NE	3		
	2.30 P	29,840		81,7		thick	8	E	3		
5	9. A	29,924		78,3		thick	10	N	3	,001	(b)
	2.20 P	29,802		82,3		thick	9	N	2		
6	6.40 A	29,850		78		thick	8	E	1	,019	(c)
	2.20 P	29,820		81,8		thick	10	NE	1		
7	7.40 A	29,914		78,3		ſtudded	6	N	2		
	2.15 P	29,900		83		thick	8	NNE	2		
8	7. A	29,932		78,8		thick	10	NE	1		(d)
	2.10 P	29,881		79,5		thick	10	NE	3		
9	7. A	29,940		74,3		thick	9	N	2	1,000	
	2.10 P	29,896		77		thick	8	NNE	3		(e)
10	1.43 A	☽ F. Q.									
	7.40 A	29,936		73		none		N	2		
	2. P	29,936		77,8		white ſcat.	3	NW	2		
11	7. A	30,022		74				N	2		(f)
	2. P	29,988		80		thick white ſc.	6	NW	2		
12	8. A	30,118		75		thick	3	NNE	2		
	2.30 P	30,036		79,3		thick	4	NNE	2		
13	8. A	30,118		74,3		thick	3	N	3		
	2. P	30,062		79		ſcattered	3	N	4		
14	7. A	30,082		71				N	3		
	2.25 P	30,024		78				NNW	3		
15	7.35 A	30,005		70,5				NW	3		
							Carried forward,		–	1,023	

(a) A ſmall ſhower at the gardens.

(b) Small rain: the produce at the gardens.

(c) It rained laſt night, and the water was meaſured this morning at the gardens. 2.20 P. At noon there was a ſmart ſhower of rain.

(d) Very gloomy and about to rain. 2.10 P. It began to rain about 8 o'clock, and it continued till near two. The ſky begins to brighten a little.

(e) Yeſterday at 3 P. it began to rain, and about 4 P. to blow, and the wind increaſed to great violence from the N and NE. About 7 P. a blaſt broke the pipe of the water-gage, at which time there was 0,5 in the ciſtern; and the quantity that fell afterwards was eſtimated at 0,5. The rain was heavy at times, and continued till one the next morning.

(f) Thick fog going off.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Nov. 1785. Miscellaneous.
								Brought forward,		1,023	
16	6.40 A	29,944		69,7							
	4.44 P	☽ Full						NW	2		
17	7.30 A	29,960		71,3	72,3			NW	2		(g)
	2.20 P	29,96		78,3				N	2		
18	7.45 A	30,036		72,5		thin	3	E	2		(h)
	2.15 P	30,013		78		ſcattered	4	WNW	2		
19	7.20 A	30,073		72		thick & thin	7	W	2		
	2.10 P	30,023		78,5		thin	4	WNW	3		
20	2.15 P	30,040		77,7		thin	3	NW	3		(i)
21	7.20 A	30,072		71,3		thick	9	N	2		(k)
	2.10 P	30,020		78		thick	6	E	2		
22	6.40 A	30,038		71,5		thick	9	ENE	4		(l)
	1.50 P	30,020		78		ſcattered	7	ENE	3		
23	7. A	29,986		72	67	thin	3	N	2		
	11.06 P	☽ Laſt									
24	8. A	29,976		73		thick	10	NE	3		
	2. P	29,920		79,5		thin	6	N	2		
25	7.30 A	29,942		72		thin	4	N	3		
28	6.20 A				59,7			N	4		(m)
	7.10 A	30,050		66,2	59,3	thin, a ſtripe in the eaſt		N	4		
	2. P	30,000		73		none		N	3		
29	7.25 A	30,022		66,5	58	none		N	3		(n)
	2.10 P	29,963		75,5				N	3		
30	6.40 A	29,977		66	59			N	3		
	2.30 P	29,940		77,3				NNW	3		
								Total in November, –		1,023	

(g) The thermometer out was in the ſun.

(h) Thin fog.

(i) This morning was very cold, but I did not obſerve.

(k) It rained about three in the morning.

(l) Very ſharp wind abroad.

(m) One very ſmall cloud. 7.10 A. Foul ſky in the Weſt. 2. P. Not a ſingle cloud to be ſeen; the ſmall ſtripe went off before 8, and the whole day has been delightfully pleaſant.

(n) Yeſterday ended as delightful as it was at noon; and to-day promiſes to be juſt as fair and pleaſant.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kinds.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain. Inches.	Dec. 1785. Miſcellaneous.
1	6.45 A	29,988		66,5	61	thin	2	W	2		
	2. P	29,976		78,2		ſcattered	3	NW	2		
2	2.42 A	☽ New									
	7.15 A	29,956		67	62	thin & thick ſca.	5	W	2		
	2. P	29,944		77,5				WNW	4		
3	7. A	30,00		69	64	thin	4	WNW	2		
	2.20 P	29,86		77		thin	4	N	2		
4	7. A	30,032		66,4	59			N	2		
5	7.			65				N	2		(*a*)
	2. P				74			WNW	2		
6	7.10 A	29,070		68				WSW	2		(*b*)
7	7. A				67,5			WSW	3		(*c*)
8	6.40 A				68			WNW	2		
9	6.30 A				52						(*d*)
	10.46 A	☽ F.Q.									
	2.20 P	30.044		79.5	77,5			WNW	3		
10	6.30 A	29.966		57	51						(*e*)
15	11. P.	30.060		58							
16	4.30 A	☽ Full									
	6. A	30,050		53	48,5			NNW	3		
	2. P	30,040		76,3	74,8			W	1		

(*a*) At *Purree Baugh.*
(*b*) Foggy.
(*c*) Foggy.
(*d*) At *Dumdum* in tents: thermometer wet with the dew.
(*e*) Very thick fog.

Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Dec. 1785. Miscellaneous.
17	6. A	29,977		62	53	thick	8				(f)
	2. P			67	73	thick	5	NW	2		
18	6. A			62		thin	5	NW	2		
19	6. A	29,963		67	52	thin	5	N	2		
	2. P	29,944		78	78	thin	6	N	3		
20	2 20 P	29,976		77	78	thin & thick	6	ENE	3		(g)
21	7. A	30,00		58	53	thick	4	E	3		(h)
	2. P	29,944		78,5	77.5	thick	8	NE	2		
22	6.30 A	30,012		57,8	53			N	2		
	1. P	30,025		79,5	76	thick	9	N	3		
23	7.20 A	30,003	45	64,5	61	none		NNE	2		
	2.35 P	29,965		72	75			NNW	2		(i)
	*8.01 P	☽ L.Q.									
24	7. A	30,024	43	67	60			NW by N	3		
25	6.40 A				59,5			NNE	3		
26	6.30 A				55			NW	2		
27	6.30 A				55			WNW	2		
	2.30 P	29,934			73			WNW	3		
29	8. A	30,088		69	59			NW by W	2		
	2.40 P	30,002		71,2	74,7			WNW	3		
31	6.31 P	☽ New									

(f) Laſt night the wind was South of the Weſt. At the gardens.
(g) In the morning it was E. 4.
(h) Exceſſive fog, but going off.
(i) At the gardens.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Jan. 1785. Miscellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
1	7. A	30,128		72,5	60			WNW	2		
3	8. A	30,116		70	63,5			W½S	2		(a)
4	8. A	30,114		69,7	62,5	thin	5	W by N	2		
	1.10 P	30,064		71,5	74	thin	6	WNW	2		
5	8.48 A	30,144		69,5	66,5	thin	2	NW	3		
6	8. A	30,212		69	61			N	3		
	2.30 P	30,172		75,5	75			N½W	4		
7	8.10 A	30,248		68,5	59			NNW	3		
	6.37 P	☽ First									
11	2. P	30,042		69,5	73.5			N	3		(b)
12	9. A	30,107		64	61	thin	2	NW	3		
	3. P	30,004		72	73	thick	3	NW by N	2		
13	8.30 A	30,078		59,5	66,5	none		NW	3		
	2 15 P	29,998		69	73			WNW	2		
14	8. A	30,124		67,6	57			NW	3		
	2.15 P	30,074		70	72,5			WNW	3		
	6.30 P	☽ Full									
15	7.30 A	30,124		66	56.5			NW½N	3		
	2.30 P	30,050		70,5	72,3			NW by N	3		
16	6 A				52			NW	3		(c)
	2.20 P				78			NW	3		

(*a*) A fog ſo thick hardly any thing is viſible.
(*b*) To-day at day-break it was 52 at *Dumdum*.
(*c*) Foggy, and piercing by cold.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer.		Clouds.		Wind.		Rain.	Jan. 1786. Miſcellaneous.
				In.	Out.	Kind.	Quant.	Quarter.	Force.		
17	6. A				50			NNW	3		
	2. P				79			NW	3		
18	6. A				49			NW	0		(d)
19	7. A	30,040		66,5	56,5			NW	2		(e)
	2.20 P				82			WNW	4		
20	6.30 A				50			W	4		
	2. P				80			W	4		
22	5.42 P	☽ Laſt									
23	0. A				47			N	3		(f)
24	6. A				50			ENE	2		
25	6. A				60			S	2		
26	7. A				68			NW	2		
	2. P				84						
27	8. A				64						
	2. P				87			W	1		
29	7 45 A				65			NE	3		(g)
	2.50 P				85			NNE	3		
30	8.00 A	☽ New									
	8.32 A				64	thick ſcat.	4	WSW	1		(h)
	2.35 P				83			NNE	4		

(*d*) Fog, and thermometer wet: the air mild to the feeling.
(*e*) Foggy.
(*f*) Thermometer wet with dew.
(*g*) Thermometer wet with dew.
(*h*) Sun eclipſed, going off.

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				Thermometer.		*Clouds.*		*Wind.*		*Rain.*	*Feb. 1786. Miscellaneous.*
Day.	*Time.*	*Barometer.*	*Hygrometer.*	*In.*	*Out.*	*Kind.*	*Quant.*	*Quarter.*	*Force.*		
1	7.15 A	29,994		72,3	67			SW	2		(*a*)
2	6.50 A	29.927		69,5	66	thick	3	SSW	3		(*b*)
3	7.45 A	30,036		67,5	63,5			N by W	3		
	2.30 P	30,009		76	75			NW	4		
4	6.30 A	30,047		67	55			WNW	3		
	2.30 P	30,060		77	75			NW by W	4		
6	2.22 A	☽ First									
	6.40 A	30,100		67	58,5			W	3		
	2.50 P	30,078		78	77			NW	4		
7	7.00 A	30,078		66	57,5			NW$\frac{1}{2}$N	3		
	3.30 P	30,020		73	77,5			NW$\frac{1}{2}$N	3		
8	7.15 A	30,068		66	59			NW$\frac{1}{2}$N	3		
10	6.50 A	30,084		68	58			WNW	3		
	2.40 P	30,087		79	79,3			W by N	3		
11	6.50 A	30,094		69	59			W by N	3		(*c*)
	2.30 P	30,026		71	80,7			E$\frac{1}{2}$S	3		
12	7 50 A	30,00		69,3	65,5			N	2		
13	7.30 A	30,00		73,2	68,3			SW by S	2		(*d*)
	10.35 A	☽ Full									
	2. P	29,956		80,5	81,3			SW	2		
14	5.50 A	29,970		71,5	66			S$\frac{1}{2}$E	2		(*e*)

(*a*) Exceſſive fog.
(*b*) Thick fog riſing into clouds.
(*c*) Foggy.
(*d*) Exceſſive fog.
(*e*) Exceſſive fog.

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Day.	Time.	Barometer.	Hygrometer.	Thermometer. In.	Thermometer. Out.	Clouds. Kind.	Clouds. Quant.	Wind. Quarter.	Wind. Force.	Rain.	Feb. 1786. Mifcellaneous.
15	1.40 P				86	thick	6	S	4		(f)
16	7. A				64	thick	3	ESE	2		(g)
	2.10 P	29,914		76	79,5	thunder	10	SSW	2		
	6. P									,1600	
17	7.50 A	29,952		70,3	64,3	thick	10	SE	5	,4200	(h)
18	7.40 A	29,992		65,5	61,3	thick fcat.	5	NNE	3	,1750	(i)
19	8.10 A	30,02		65	65			WNW	4		
21	7.40 A	29,892		69	65,4			SW½S	3		
	2.11 P	☾ Laft									
22	6. P	29,882		77	77	thick thund.	7	S	3		(k)
23	8. A	29,970		74	75	thick	10	SSW	3		(l)
24	2.30 P	29,982		76	80,8	thick	6	NW	3	,1800	(m)
25	8. A	30,062		74	73,5			S by E	2		
	2.30 P	30,000		78	82	thick	4	ENE½N	2		
26	7.15 A	30,076		73	69,3	thick	10	NNW	2		(n)
	2.30 P	30,066		78,5	80,5	ditto	10	N by E	3		
27	7.10 A	30,095		72 5	70,3	ditto	10	NW	2		
28	2.20 P	30,058		77	85	thunder	6	W	2		(o)
	8.20 P	☽ New									

TOTAL IN FEBRUARY, 0,936

(f) The clouds have been thick 9, and it looked as if it was about to rain.

(g) Foggy (at Dumdum). 2.10 P. (At the Gardens) thunder coming on and drawing near. 6. P. Rain had be-gan in drops when laft obfervation was made, there was thunder but not any thunder guft.

(h) It has been a very tempeftuous night with exceffively heavy thunder, and of very long continuance, the thunder fhook the whole houfe feveral times.

(i) This fell in the laft night.

(k) The wind has been S.6 the greateft part of the day

(l) It lightened a good deal till 8 P, and then cleared fuddenly.

(m) This water fell in a thunder fhower laft night, from the W and NW with much lightning, though but little wind.

(n) Much lightning in the former part of the night, and a guft of wind from N about 11.

(o) Very heavy fog this morning, and a mafs forming.

ASIATICK RESEARCHES:

OR,

TRANSACTIONS

OF THE

SOCIETY INSTITUTED IN BENGAL,

FOR INQUIRING INTO THE

HISTORY AND ANTIQUITIES, THE ARTS, SCIENCES, AND LITERATURE,

OF

ASIA.

VOLUME THE SECOND.

ADVERTISEMENT.

IT may greatly conduce to the advancement of uſeful knowledge, if the learned ſocieties, eſtabliſhed in *Europe*, will tranſmit to the Secretary of the Society in *Bengal* a collection of ſhort and preciſe queries on every branch of *Aſiatick* Hiſtory, natural and civil, on the Philoſophy, Mathematicks, Antiquities, and Polite Literature, of *Aſia*, and on eaſtern Arts, both liberal and mechanick ; ſince it is hoped, that accurate anſwers may in due time be procured to any queſtions, that can be propoſed on thoſe ſubjects, which muſt in all events be curious and intereſting, and may prove in the higheſt degree beneficial to mankind.

I.

THE FOURTH ANNIVERSARY DISCOURSE, DELIVERED 15 FEBRUARY, 1787. *See the Works of Sir William Jones, Vol. I. p. 35.*

II.

THE FIFTH ANNIVERSARY DISCOURSE, DELIVERED 21 FEBRUARY, 1788. *See the Works of Sir William Jones, Vol. I. p. 51.*

III.

THE SIXTH ANNIVERSARY DISCOURSE, DELIVERED 19 FEBRUARY, 1789. *See the Works of Sir William Jones, Vol. I. p. 73.*

IV.

A LETTER FROM THE LATE HENRY VANSITTART, ESQ. TO THE PRESIDENT.

SIR,

HAVING ſome time ago met with a *Perſian* abridgement, compoſed by *Maulavì* KHAIRU'DD'IN, of the *Aſráru'l afághinah*, or the ſecrets of the *Afghàns*, a book written in the *Puſhto* language by HUSAIN, the ſon of SA'BIR, the ſon of KHIZR, the diſciple of *Hazrat* SHA'H KA'SIM *Sulaimánì*, whoſe tomb is in *Chunárgur*, I was induced to tranſlate it. Although it opens with a very wild deſcription of the origin of that tribe, and contains a narrative, which can by no means be offered upon the whole as a ſerious and probable hiſtory, yet I conceive, that the knowledge of what a nation ſuppoſe themſelves to be, may be intereſting to a ſociety like this, as well as of what they really are: indeed the commencement of almoſt every

every hiſtory is fabulous; and the moſt enlightened nations, after they have arrived at that degree of civilization and importance, which has enabled and induced them to commemorate their actions, have always found a vacancy at their outſet, which invention, or at beſt preſumption, muſt ſupply. Such fictions appear at firſt in the form of traditions; and, having in this ſhape amuſed ſucceſſive generations by a gratification of their national vanity, they are committed to writing, and acquire the authority of hiſtory.

As a kingdom is an aſſemblage of component parts, condenſed by degrees, from ſmaller aſſociations of individuals, to their general union, ſo hiſtory is a combination of the tranſactions not only of the different tribes, but even of the individuals of the nation, of which it treats: each particular narrative in ſuch a general collection muſt be ſummary and incomplete. Biography therefore, as well as deſcriptions of the manners, actions, and even opinions of ſuch tribes, as are connected with a great kingdom, are not only entertaining in themſelves, but uſeful; as they explain and throw a light upon the hiſtory of the nation.

Under theſe impreſſions, I venture to lay before the Society the tranſlation of an abridged hiſtory of the *Afghàns*, a tribe at different times ſubject to, and always connected with, the kingdoms of *Perſia* and *Hinduſtàn*. I alſo ſubmit a ſpecimen of their language, which is called by them *Pukhto*; but this word is ſoftened in *Perſian* into *Puſhto*.

I am, Sir,

With the greateſt reſpect,

Your moſt obedient humble ſervant,

HENRY VANSITTART.

Calcutta, March 3, 1784.

ON

ON THE DESCENT OF THE AFGHANS FROM THE JEWS.

THE *Afghàns*, according to their own traditions, are the poſterity of MELIC TA'LU'T (king SAUL), who, in the opinion of ſome, was a deſcendant of JUDAH, the ſon of JACOB, and according to others, of BENJAMIN, the brother of JOSEPH.

In a war, which raged between the children of *Iſrael* and the *Amalekites*, the latter, being victorious, plundered the *Jews*, and obtained poſſeſſion of the ark of the covenant. Conſidering this the God of the *Jews*, they threw it into fire, which did not affect it. They afterwards attempted to cleave it with axes, but without ſucceſs: every individual, who treated it with indignity, was puniſhed for his temerity. They then placed it in their temple, but all their idols bowed to it. At length they faſtened it upon a cow, which they turned looſe in the wilderneſs.

When the Prophet SAMUEL aroſe, the children of *Iſrael* ſaid to him: "We "have been totally ſubdued by the *Amalekites*, and have no king. Raiſe to us a "king, that we may be enabled to contend for the glory of God." SAMUEL ſaid: "In caſe you are led out to battle, are you determined to fight?" They anſwered: "What has befallen us, that we ſhould not fight againſt infidels? That "nation has baniſhed us from our country and children." At this time the Angel GABRIEL deſcended, and, delivering a wand, ſaid: "It is the command of GOD, "that the perſon whoſe ſtature ſhall correſpond with this wand ſhall be king of "*Iſrael*."

MELIC TA'LU'T was at that time a man of inferiour condition, and performed the humble employment of feeding the goats and cows of others. One day a cow under his charge was accidentally loſt. Being diſappointed in his ſearches, he was greatly diſtreſſed, and applied to SAMUEL, ſaying, "I have loſt a cow, "and do not poſſeſs the means of ſatisfying the owner. Pray for me, that I "may be extricated from this difficulty." SAMUEL, perceiving that he was a man of lofty ſtature, aſked his name. He anſwered TA'LU'T. SAMUEL then ſaid: "Meaſure TA'LU'T with the wand, which the Angel GABRIEL brought." His ſtature was equal to it. SAMUEL then ſaid: "GOD has raiſed TA'LU'T to "be your king." The children of *Iſrael* anſwered; "We are greater than our king. "We are men of dignity, and He is of inferiour condition. How, ſhall He be "our king?" SAMUEL informed them, they ſhould know, that God had conſtituted

tuted TA'LU'T their king, by his reſtoring the ark of the covenant. He accordingly reſtored it, and they acknowledged him their ſovereign.

After TA'LU'T obtained the kingdom, he ſeized part of the territories of JALU'T, or GOLIAH, who aſſembled a large army, but was killed by DAVID. TA'LU'T afterwards died a martyr in a war againſt the infidels; and God conſtituted DAVID king of the *Jews*.

MELIC TA'LU'T had two ſons, one called BERKIA, and the other IRMIA, who ſerved DAVID, and were beloved by him. He ſent them to fight againſt the infidels; and, by GOD's aſſiſtance, they were victorious.

The ſon of BERKIA was called AFGH'AN, and the ſon of IRMIA was named USBEC. Thoſe youths diſtinguiſhed themſelves in the reign of DAVID, and were employed by SOLOMON. AFGH'AN was diſtinguiſhed by his corporal ſtrength, which ſtruck terror into Demons and Genii. USBEC was eminent for his learning.

AFGH'AN uſed frequently to make excurſions to the mountains; where his progeny, after his death, eſtabliſhed themſelves, lived in a ſtate of independence, built forts, and exterminated the infidels.

When the ſelect of creatures, MUHAMMED, appeared upon earth, his fame reached the AFGH'ANS, who ſought him in multitudes under their leaders KHALID and ABDUL RASHI'D, ſons of WAL'ID. The prophet honoured them with the moſt gracious reception, ſaying: "Come, O *Mulúc*, or Kings;" whence they aſſumed the title of *Melic*, which they enjoy to this day. The prophet gave them his enſign, and ſaid that the faith would be ſtrengthened by them.

Many ſons were born of KHA'LID, the ſon of WAL'ID, who ſignalized themſelves in the preſence of the prophet, by fighting againſt the infidels. MUHAMMED honoured and prayed for them.

In the reign of Sultan MAHMU'D of *Ghaznah*, eight men arrived, of the poſterity of KHA'LID, the ſon of WAL'ID, whoſe names were KALUN, ALUN, DAUD, YALUA, AHMED, AWIN, and GHA'ZI'. The ſultan was much pleaſed with them, and appointed each a commander in his army. He alſo conferred on them the offices of *Vazír*, and *Vakíli Mutlak*, or Regent of the Empire.

Wherever they were ſtationed, they obtained poſſeſſion of the country, built moſques, and overthrew the temples of idols. They encreaſed ſo much, that the army of MAHMU'D was chiefly compoſed of *Afghàns*. When HERHIND, a powerful prince of *Hinduſtàn*, meditated an invaſion of *Ghaznah*, Sultan MAHMU'D diſpatched

diſpatched againſt him the deſcendants of KHA'LID with twenty thouſand horſe: a battle enſued; the *Afghàns* made the attack; and, after a ſevere engagement, which laſted from daybreak till noon, defeated HERHIND, killed many of the infidels, and converted ſome to the *Muhammedan* faith.

The *Afghàns* now began to eſtabliſh themſelves in the mountains; and ſome ſettled in cities with the permiſſion of Sultan MAHMU'D. They framed regulations, dividing themſelves into four claſſes, agreeably to the following deſcription. The firſt is the *pure* claſs, conſiſting of thoſe, whoſe fathers and mothers were *Afghàns*. The ſecond claſs conſiſts of thoſe, whoſe fathers were *Afghàns*, and mothers of another nation. The third claſs contains thoſe, whoſe mothers were *Afghàns*, and fathers of another nation. The fourth claſs is compoſed of the children of women, whoſe mothers were *Afghàns*, and fathers and huſbands of a different nation. Perſons, who do not belong to one of the claſſes, are not called *Afghàns*.

After the death of Sultan MAHMU'D they made another ſettlement in the mountains. SHIHA'BUDDI'N *Gaurì*, a ſubſequent Sultan of *Ghaznah*, was twice repulſed from *Hinduſtàn*. His *Vazìr* aſſembled the people, and aſked, if any of the poſterity of KHA'LID were living. They anſwered: "Many now live in a "ſtate of independence in the mountains, where they have a conſiderable army." The *Vazìr* requeſted them to go to the mountains, and by entreaties prevail on the *Afghàns* to come; for they were the deſcendants of companions of the prophet.

The inhabitants of *Ghaznah* undertook this embaſſy, and, by entreaties and preſents, conciliated the minds of the *Afghàns*, who promiſed to engage in the ſervice of the Sultan, provided he would himſelf come and enter into an agreement with them. The Sultan viſited them in their mountains, honoured them, and gave them dreſſes and other preſents. They ſupplied him with twelve thouſand horſe, and a conſiderable army of infantry. Being diſpatched by the Sultan before his own army, they took *Dehli*, killed *Roy Pahtoura* the king, his miniſters and nobles; laid waſte the city, and made the infidels priſoners. They afterwards exhibited nearly the ſame ſcene in *Canauj*.

The Sultan, pleaſed by the reduction of thoſe cities, conferred honours upon the *Afghàns*. It is ſaid that he then gave them the titles of *Patan* and *Khan*. The word *Patan* is derived from the *Hindi* verb *Paitna*, *to ruſh*, in alluſion to their alacrity in attacking the enemy. The *Patans* have greatly diſtinguiſhed themſelves in the hiſtory of *Hinduſtan*, and are divided into a variety of ſects.

The race of *Afghàns* poſſeſſed themſelves of the mountain of SOLOMON, which is near *Kandahàr*, and the circumjacent country, where they have built forts: this tribe has furniſhed many kings. The following monarchs of this race have ſat upon the throne of *Dehlì:* Sultan *Behlole*, *Afghàn* LOD'I, Sultan SECANDER, Sultan IBRA'HI'M, SHI'R SHA'H, ISLAM SHA'H, ADIL SHA'H SUR. They alſo number the following kings of *Gaur*; SOLAIM'AN *Shàh Gurzani*, BAYAZI'D *Shàh*, and KUTB *Shàh*; beſides whom their nation has produced many conquerors of provinces. The *Afghàns* are called *Solaimánì*, either becauſe they were formerly the ſubjects of SOLOMON, king of the *Jews*, or becauſe they inhabit the mountain of SOLOMON.

The tranſlation being finiſhed, I ſhall only add, that the country of the *Afghàns*, which is a province of *Cábul*, was originally called *Roh*, and from hence is derived the name of the *Rohillahs*. The city, which was eſtabliſhed in it by the *Afghàns*, was called by them *Paiſhwer*, or *Paiſhòr*, and is now the name of the whole diſtrict. The ſects of the *Afghàns*, or *Patàns*, are very numerous. The principal are theſe: *Lodì*, *Lohauni*, *Sùr*, *Serwánì*, *Yúſufzihi*, *Bangiſh*, *Dilazai*, *Khattì*, *Yasìn*, *Khail*, and *Baloje*. The meaning of *Zihì* is offspring, and of *Khail*, ſect. A very particular account of the *Afghàns* has been written by the late HA'FIZ RAHMAT KHAN, a chief of the *Rohillahs*, from which the curious reader may derive much information. They are *Muſelmans*, partly of the *Sunni*, and partly of the *Shiah* perſuaſion. They are great boaſters of the antiquity of their origin, and reputation of their tribe, but other *Muſelmans* entirely reject their claim, and conſider them of modern, and even baſe, extraction. However, their character may be collected from hiſtory. They have diſtinguiſhed themſelves by their courage, both ſingly and unitedly, as principals and auxiliaries. They have conquered for their own princes and for foreigners, and have always been conſidered the main ſtrength of the army, in which they have ſerved. As they have been applauded for virtues, they have alſo been reproached for vices, having ſometimes been guilty of treachery, and even acted the baſe part of aſſaſſins.

A SPE-

A SPECIMEN OF THE PUSHTO LANGUAGE.

لِسَتمٓ ظَالِمَانٓ حاَکِمَانٓ
اَوْر گوْر پيْشَوْر دِرِي وَاْ رَه يَوْ دِيْ

By the oppreſſion of tyrannical rulers,
Fire, the grave, and *Paiſhor*, all three have been rendered equal.

دَ سبَنّتٓ و پرٓ خْصَتَ دَيْ رَاْ غلِيْ رَوَا پَتْ

With reſpect to prayers enjoined by the *Sunnah*, they are remitted.
It is thus expreſſed in the reports:

کَاَئِ اُوکَاِد يْرَه شِهوِيْ کَاَئِ نَکَهِ هيْس پِرَيْ نَوِيْ

If a *man* perform them, it is very laudable. If he do not perform them, it is no crime in him.

مير زا خان
اِيْ مِير زَاکَهَ دَ خُوْيِ بِهتَرِيْ نَوِيْ
دَ سَيّد تَغَا وَتْ سِه دَيْ لَهَ بَاْمنَهَ

If the diſpoſition be not good, *O Mirza*,
What difference is there between a *Sayyed* and a *Brahman!*

NOTE TO MR. VANSITTART'S PAPER ON THE AFGHANS BEING DESCENDED FROM THE JEWS. *See the Works of Sir William Jones, Vol. I. p.* 331.

V. RE-

V.

REMARKS ON THE ISLAND OF HINZUAN, OR JOHANNA. *See the Works of Sir William Jones, Vol. I. p. 485.*

VI.

ON THE BAYA, OR INDIAN GROSS-BEAK. *See the Works of Sir William Jones, Vol. I. p. 543.*

VII.

ON THE CHRONOLOGY OF THE HINDUS. *See the Works of Sir William Jones, Vol. I. p. 281.*

VIII.

ON THE CURE OF THE ELEPHANTIASIS. *See the Works of Sir William Jones, Vol. I. p. 549.*

ON THE CURE OF THE ELEPHANTIASIS, AND OTHER DISORDERS OF THE BLOOD. *See the Works of Sir William Jones, Vol. I. p. 553.*

IX.

ON THE INDIAN GAME OF CHESS. *See the Works of Sir William Jones, Vol. I. p. 521.*

X. TWO

X.

TWO INSCRIPTIONS FROM THE VINDHYA MOUNTAINS, TRANSLATED FROM THE SANSCRIT BY CHARLES WILKINS, ESQ.

FIRST INSCRIPTION,

In a Cavern, called the Grot of the Seven Rishi's, *near* Gaya.

1. ANANTA VARMA, master of the hearts of the people, who was the good son of *Sree* SARDOOLA, by his own birth and great virtues classed amongst the principal rulers of the earth, gladly caused this statue of KREESHNA of unsullied renown, confirmed in the world like his own reputation, and the image of KANTEEMATEE *, to be deposited in this great mountain-cave.

2. *Sree* SARDOOLA, of established fame, jewel of the diadems of kings, emblem of time to the martial possessors of the earth, to the submissive the tree of the fruit of desire, a light to the Military Order, whose glory was not founded upon the feats of a single battle, the ravisher of female hearts, and the image of SMARA †, became the ruler of the land.

3. Wherever *Srēē* SARDOOLA is wont to cast his own discordant sight towards a foe, and the fortunate star, his broad eye is enflamed with anger between its expanded lids, *there* falleth a shower of arrows from the ear-drawn string of the bow of his son, the renowned ANANTA VARMA, the bestower of infinite happiness.

SECOND INSCRIPTION,

In a Cave behind Nagarjeni.

1. THE auspicious *Srēē* YAJNA VARMA, whose movement was as the sportive elephant's in the season of lust, was, like MANOO ‡, the appointer of the military

* RADHA, the favourite Mistress of KREESHA.

† KAMA DEVA the *Cupid* of the *Hindoos.*

‡ The first legislator of the *Hindoos.*

station

ſtation of all the chiefs of the earth.—By whoſe divine offerings, the God with a thouſand eyes * being conſtantly invited, the emaciated *Powlōmēē* †, for a long time, ſullied the beauty of her cheeks with falling tears.

2. ANANTA VARMA by name, the friend of ſtrangers; renowned in the world in the character of valour; by nature immaculate as the lunar beams, and who is the offspring of *Srēē* SARDOOLA:—By him this wonderful ſtatue of BHOOTAPATEE and of DEVEE ‡, the maker of all things viſible and inviſible and the granter of boons, which hath taken ſanctuary in this cave, was cauſed to be made. May it protect the univerſe!

3. The ſtring of his expanded bow, charged with arrows and drawn to the extremity of the ſhoulder, burſteth the circle's centre. Of ſpacious brow, propitious diſtinction, and ſurpaſſing beauty, he is the image of the moon with an undimiſhed countenance. ANANTA VARMA to the end! Of form like SMARA § in exiſtence, he is ſeen with the conſtant and affectionate ſtanding with their tender and faſcinated eyes conſtantly fixed upon him.

4. From the machine his bow, reproacher of the crying *Kōōrără* ||, bent to the extreme, he is endued with force; from his expanded virtue he is a provoker; by his good conduct his renown reacheth to afar; he is a hero by whoſe courſing ſteeds the elephant is diſturbed, and a youth who is the ſeat of ſorrow to the women of his foes. He is the director, and his name is ANANTA **.

* *Eēndră*, a deification of the Heavens.

† The wife of *Eēndră*.

‡ *Sēēvă*, or *Măhādēvă* and his conſort in one image, as a type of the deities, *Genitor* and *Genitrix*.

§ The Hindoo *Cupid*.

|| A bird that is conſtantly making a noiſe before rain.

** This word ſignifies eternal or infinite.

XI. A

XI.

A DESCRIPTION OF AS'AM BY MOHAMMED CAZIM, TRANSLATED FROM THE PERSIAN BY HENRY VANSITTART, ESQ.*

AS'AM, which lies to the north-eaſt of *Bengal*, is divided into two parts by the river *Brahmaputra*, that flows from *Khatà*. The northern portion is called *Uttarcul*, and the ſouthern *Dacſhincul*. *Uttarcul* begins at *Gowahutty*, which is the boundary of his Majeſty's territorial poſſeſſions, and terminates in mountains inhabited by a tribe called *Meeri Mechmi*. *Dacſhincul* extends from the village *Sidea* to the hills of *Srinagar*. The moſt famous mountains to the northward of *Uttarcul* are thoſe of *Duleh* and *Landah*; and to the ſouthward of *Dacſhincul* are thoſe of *Namrup* (*Cámrùp?*), ſituated four days' journey above *Ghergong*, to which the *Rájá* retreated. There is another chain of hills, which is inhabited by a tribe called *Nanac*, who pay no revenue to the *Rájá*, but profeſs allegiance to him, and obey a few of his orders. But the † *Zemleh* tribe are entirely independent of him, and, whenever they find an opportunity, plunder the country contiguous to their mountains. *Asàm* is of an oblong figure: its length is about 200 ſtandard coſs, and its breadth, from the northern to the ſouthern mountains, about eight days' journey. From *Gowahutty* to *Ghergong* are ſeventy-five ſtandard coſs; and from thence it is fifteen days' journey to *Khoten*, which was the reſidence of *Peeran Wiſeh* ‡, but is now called *Ava* §, and is the capital of the *Rájá* of *Pegu*, who conſiders himſelf of the poſterity of that famous general. The firſt five days' journey from the mountains of *Cámrùp* is performed through foreſts, and over hills, which are arduous and difficult to paſs. You then travel eaſtward to *Ava* through a level and ſmooth country. To the northward is the plain of *Khatà*, that has been before mentioned as the place from whence the *Brahmaputra* iſſues, which is afterwards fed by ſeveral rivers that flow from the ſouthern mountains of *Asàm*. The principal of

* This account of *Asàm* was tranſlated for the ſociety, but afterwards printed by the learned tranſlator as an appendix to his *Aá emgírnámah*. It is reprinted here, becauſe our government has an intereſt in being as well acquainted as poſſible with all the nations *bordering* on the *Britiſh* territories.

† In another copy this tribe are called *Duſleh*.

‡ According to *Khondemir*, *Peeran Wiſeh* was one of the nobles of *Afraſiab*, king of *Turàn*, contemporary with *Kaicaus*, ſecond prince of the *Kianian* Dynaſty. In the *Ferhung Jehangeery* and *Borhaun Kateá* (two Perſian dictionaries), *Peeran* is deſcribed as one of the *Pehlovan* or heroes of *Turàn*, and general under *Afraſiab*, the name of whoſe father was *Wiſeh*.

§ This is a palpable miſtake. *Khoten* lies to the north of *Himálaya*; and *Fíràn Viſah* could never have ſeen *Ava*.

these

theſe is the *Dhonec*, which has before occurred in this hiſtory. It joins that broad river at the village *Luckeigereh*.

Between theſe rivers is an iſland well inhabited, and in an excellent ſtate of tillage. It contains a ſpacious, clear, and pleaſant country, extending to the diſtance of about fifty coſs. The cultivated tract is bounded by a thick foreſt, which harbours elephants, and where thoſe animals may be caught, as well as in four or five other foreſts of *Asàm*. If there be occaſion for them, five or ſix hundred elephants may be procured in a year. Acroſs the *Dhonec*, which is the ſide of *Ghergong*, is a wide, agreeable, and level country, which delights the heart of the beholder. The whole face of it is marked with population and tillage; and it preſents on every ſide charming proſpects of ploughed fields, harveſts, gardens, and groves. All the iſland before deſcribed lies in *Dacſhincul*. From the village *Selagereh* to the city of *Ghergong* is a ſpace of about fifty coſs, filled with ſuch an uninterrupted range of gardens, plentifully ſtocked with fruit-trees, that it appears as one garden. Within them are the houſes of the peaſants, and a beautiful aſſemblage of coloured and fragrant herbs, and of garden and wild flowers blowing together. As the country is overflowed in the rainy ſeaſon, a high and broad cauſſey has been raiſed for the convenience of travellers from *Salagereh* to *Ghergong*, which is the only uncultivated ground that is to be ſeen. Each ſide of this road is planted with ſhady bamboos, the tops of which meet, and are intertwined. Amongſt the fruits which this country produces, are mangoes, plantains, jacks, oranges, citrons, limes, pine-apples, and *punialeh*, a ſpecies of *amleh*, which has ſuch an excellent flavour, that every perſon who taſtes it prefers it to the plum. There are alſo cocoa-nut trees, pepper vines, *areca* trees, and the *ſádij**, in great plenty. The ſugar-cane excels in ſoftneſs and ſweetneſs, and is of three colours, red, black, and white. There is ginger free from fibres, and betel vines. The ſtrength of vegetation and fertility of the ſoil are ſuch, that whatever ſeed is ſown, or ſlips planted, they always thrive. The environs of *Ghergong* furniſh ſmall apricots, yams, and pomegranates; but as theſe articles are wild, and not aſſiſted by cultivation and engraftment, they are very indifferent. The principal crop of this country conſiſts in rice and *maſh* †. *Ades* is very ſcarce, and wheat and barley are never ſown. The ſilks are excellent, and reſemble thoſe of *China*; but they manufacture very few more than are re-

* The *Sádij* is a long aromatick leaf, which has a pungent taſte, and is called in *Sanſcrit Téjapatra*. In our botanical books it bears the name of *Malabathrum*, or the *Indian* leaf.

† *Maſh* is a ſpecies of grain, and *Ades* a kind of pea.

quired

quired for uſe. They are ſucceſsful in embroidering with flowers, and in weaving velvet, and *tautbund,* which is a ſpecies of ſilk of which they make tents and *kenauts* *. Salt is a very precious and ſcarce commodity. It is found at the bottom of ſome of the hills, but of a bitter and pungent quality. A better ſort is in common uſe, which is extracted from the plantain tree. The mountains, inhabited by the tribe called *Nanac*, produce plenty of excellent *Lignum Aloes*, which a ſociety of the natives imports every year into *Asàm*, and barters for ſalt and grain. This evil-diſpoſed race of mountaineers are many degreee removed from the line of humanity, and are deſtitute of the characteriſtical properties of a man. They go naked from head to foot, and eat dogs, cats, ſnakes, mice, rats, ants, locuſts, and every thing of this ſort which they can find. The hills of *Cámrùp*, *Sidea*, and *Luckigereh,* ſupply a fine ſpecies of *Lignum Aloes,* which ſinks in water. Several of the mountains contain muſk-deer.

The country of *Uttarcul,* which is on the northern ſide of the *Brahmaputra,* is in the higheſt ſtate of cultivation, and produces plenty of pepper and *Areca*-nuts. It even ſurpaſſes *Dacſhincul* in population and tillage; but, as the latter contains a greater tract of wild foreſts, and places difficult of acceſs, the rulers of *Asàm* have choſen to reſide in it for the convenience of controul, and have erected in it the capital of the kingdom. The breadth of *Uttarcul,* from the bank of the river to the foot of the mountains, which is a cold climate, and contains ſnow, is various, but is no where leſs than fifteen coſs, nor more than forty-five coſs. The inhabitants of thoſe mountains are ſtrong, have a robuſt and reſpectable appearance, and are of a middling ſize. Their complexions, like thoſe of the natives of all cold climates, are red and white; and they have alſo trees and fruits peculiar to frigid regions. Near the fort of *Jum Dereh,* which is on the ſide of *Gowahutty,* is a chain of mountains, called the country of *Dereng,* all the inhabitants of which reſemble each other in appearance, manners, and ſpeech, but are diſtinguiſhed by the names of their tribes, and places of reſidence. Several of theſe hills produce muſk, *kataus* †, *bhoat* ‡, *peree*, and two ſpecies of horſes, called *goont* and *tanyans.* Gold and ſilver are procured here, as in the whole country of *Asàm*, by waſhing the ſand of the rivers. This, indeed, is one of the ſources of revenue. It is ſuppoſed that

* *Kenauts* are walls made to ſurround tents.

† Kataus is thus deſcribed in the *Borhaun Katea:* "This word, in the language of *Rùm*, is a ſeacow; the tail of "which is hung upon the necks of horſes, and on the ſummit of ſtandards. Some ſay that it is a cow which lives in "the mountains of *Khatà*." It here means the mountain-cow, which ſupplies the tail that is made into *chowries*, and in *Sanſcrit* is called *chámara*.

‡ *Bhoat* and *peree* are two kinds of blanket.

12,000 inhabitants, and ſome ſay, 20,000, are employed in this occupation; and it is a regulation, that each of theſe perſons ſhall pay a fixed revenue of a *tólà* * of gold to the *Ràjà*. The people of *Asàm* are a baſe and unprincipled nation, and have no fixed religion. They follow no rule but that of their own inclinations, and make the approbation of their own vicious minds the teſt of the propriety of their actions. They do not adopt any mode of worſhip practiſed either by *Heathens* or *Mohammedans*; nor do they concur with any of the known ſects which prevail amongſt mankind. Unlike the Pagans of *Hinduſtàn*, they do not reject victuals which have been dreſſed by *Muſelmans*; and they abſtain from no fleſh except human. They even eat animals that have died a natural death; but, in conſequence of not being uſed to the taſte of ghee, they have ſuch an antipathy to this article, that if they diſcover the leaſt ſmell of it in their victuals, they have no reliſh for them. It is not their cuſtom to veil their women; for even the wives of the *Ràjà* do not conceal their faces from any perſon. The females perform work in the open air, with their countenances expoſed, and heads uncovered. The men have often four or five wives each, and publickly buy, ſell, and change them. They ſhave their heads, beards, and whiſkers, and reproach and admoniſh every perſon who neglects this ceremony. Their language has not the leaſt affinity with that of *Bengal* †. Their ſtrength and courage are apparent in their looks; but their ferocious manners, and brutal tempers, are alſo betrayed by their phyſiognomy. They are ſuperior to moſt nations in corporal force and hardy exertions. They are enterprizing, ſavage, fond of war, vindictive, treacherous, and deceitful. The virtues of compaſſion, kindneſs, friendſhip, ſincerity, truth, honour, good faith, ſhame, and purity of morals, have been left out of their compoſition. The ſeeds of tenderneſs and humanity have not been ſown in the field of their frames. As they are deſtitute of the mental garb of manly qualities, they are alſo deficient in the dreſs of their bodies. They tie a cloth round their heads, and another round their loins, and throw a ſheet upon their ſhoulder; but it is not cuſtomary in that country to wear turbans, robes, drawers, or ſhoes. There are no buildings of brick or ſtone, or with walls of earth, except the gates of the city of *Ghergong*, and ſome of their idolatrous temples. The rich and poor conſtruct their habitations of wood, bamboos, and ſtraw. The *Ràjà* and his courtiers travel in ſtately

* Eighty *rati*-weights.

† This is an error: young *Bráhmens* often come from *Asàm* to *Nadíyà* for inſtruction, and their vulgar dialect is underſtood by the *Bengal* teachers.

litters;

litters; but the opulent and refpectable perfons amongft his fubjects are carried in lower vehicles, called doolies. *Asàm* produces neither horfes *, camels, nor affes; but thofe cattle are fometimes brought thither from other countries. The brutal inhabitants, from a congenial impulfe, are fond of feeing and keeping affes; and buy and fell them at a high price; but they difcover the greateft furprize at feeing a camel; and are fo afraid of a horfe, that if one trooper fhould attack a hundred armed *Afamians*, they would all throw down their arms and flee; or fhould they not be able to efcape, they would furrender themfelves prifoners. Yet, fhould one of that deteftable race encounter two men of another nation on foot, he would defeat them.

The ancient inhabitants of this country are divided into two tribes, the *Afamians* and the *Cultanians*. The latter excel the former in all occupations except war, and the conduct of hardy enterprifes, in which the former are fuperior. A body-guard of fix or feven thoufand *Afamians*, fierce as demons, of unfhaken courage, and well provided with warlike arms and accoutrements, always keep watch near the *Rájá's* fitting and fleeping apartments; thefe are his loyal and confidential troops and patrol. The martial weapons of this country are the mufquet, fword, fpear, and arrow and bow of bamboo. In their forts and boats they have alfo plenty of cannon, *zerbzen* †, and *ramchangee*, in the management of which they are very expert.

Whenever any of the *Rájá's*, magiftrates, or principal men die, they dig a large cave for the deceafed, in which they inter his women, attendants, and fervants, and fome of the magnificent equipage and ufeful furniture, which he poffeffed in his lifetime, fuch as elephants, gold and filver, *bádcafh* (large fans), carpets, clothes, victuals, lamps, with a great deal of oil, and a torch-bearer; for they confider thofe articles as ftores for a future ftate. They afterwards conftruct a ftrong roof over the cave upon thick timbers. The people of the army entered fome of the old caves, and took out of them the value of 90,000 rupees, in gold and filver. But an extraordinary circumftance is faid to have happened, to which the mind of man can fcarcely give credit, and the probability of which is contradicted by daily experience. It is this: All the nobles came to the Imperial General, and declared, with univerfal agreement, that a golden betel ftand was found in one of the caves, that was dug eighty years before, which contained betel-leaf quite green and frefh; but the authenticity of this ftory refts upon report.

* As the author has afferted that two fpecies of horfes, called *goont* and *tanyans*, are produced in *Dereng*, we muft fuppofe that this is a different country from *Asàm*.

† Swivels.

Ghergong

Ghergong has four gates, conftructed of ftone and earth; from each of which the *Rájá's* palace is diftant three cofs. The city is encompaffed with a fence of bamboos, and within it high and broad cauffeys have been raifed for the convenience of paffengers during the rainy feafon. In the front of every man's houfe is a garden, or fome cultivated ground. This is a fortified city, which enclofes villages and tilled fields. The *Rájá's* palace ftands upon the bank of the *Degoo*, which flows throughout the city. This river is lined on each fide with houfes, and there is a fmall market, which contains no fhopkeepers except fellers of betel. The reafon is, that it is not cuftomary for the inhabitants to buy provifions for daily ufe, becaufe they lay up a ftock for themfelves, which lafts them a year. The *Rájá's* palace is furrounded by a cauffey, planted on each fide with a clofe hedge of bamboos, which ferves inftead of a wall. On the outfide there is a ditch, which is always full of water. The circumference of the enclofure is one cofs and fourteen jereebs. Within it have been built lofty halls, and fpacious apartments for the *Rájá*, moft of them of wood, and a few of ftraw, which are called *chuppers*. Amongft thefe is a *díwàn kâhnah*, or publick faloon, one hundred and fifty cubits long, and forty broad, which is fupported by fixty-fix wooden pillars, placed at an interval of about four cubits from each other. The *Rájá's* feat is adorned with lattice-work and carving. Within and without have been placed plates of brafs, fo well polifhed, that when the rays of the fun ftrike upon them, they fhine like mirrors. It is an afcertained fact, that 3000 carpenters and 12,000 labourers were conftantly employed in this work, during two years, before it was finifhed. When the *Rájá* fits in this chamber, or travels, inftead of drums and trumpets they beat the * *dhól* and *dand*. The latter is a round and thick inftrument made of copper, and is certainly the fame as the drum †, which it was cuftomary, in the time of the ancient kings, to beat in battles and marches.

The *Rájá's* of this country have always raifed the creft of pride and vain-glory, and difplayed an oftentatious appearance of grandeur, and a numerous train of attendants and fervants. They have not bowed the head of fubmiffion and obedience, nor have they paid tribute or revenue to the moft powerful monarch; but they have curbed the ambition, and checked the conquefts, of the moft victorious princes of *Hinduftàn*. The folution of the difficulties attending a war againft them, has baffled the penetration of heroes, who have been ftyled conquerors of the world. Whenever an invading army has entered their territories, the *Afamians* have covered

* The *dhól* is a kind of drum, which is beaten at each end.
† This is a kind of kettle-drum, and is made of a compofition of feveral metals.

themfelves

themſelves in ſtrong poſts, and have diſtreſſed the enemy by ſtratagems, ſurpriſes, and alarms, and by cutting off their proviſions. If theſe means have failed, they have declined a battle in the field, but have carried the peaſants into the mountains, burnt the grain, and left the country empty. But when the rainy ſeaſon has ſet in upon the advancing enemy, they have watched their opportunity to make excurſions, and vent their rage; the famiſhed invaders have either become their priſoners, or been put to death. In this manner powerful and numerous armies have been ſunk in that whirlpool of deſtruction, and not a ſoul has eſcaped.

Formerly HUSAIN SH'AH, a King of *Bengal*, undertook an expedition againſt *Asàm*, and carried with him a formidable force in cavalry, infantry, and boats. The beginning of this invaſion was crowned with victory. He entered the country, and erected the ſtandard of ſuperiority and conqueſt. The *Rájá* being unable to encounter him in the field, evacuated the plains, and retreated to the mountains. HUSAIN left his ſon, with a large army, to keep poſſeſſion of the country, and returned to *Bengal.* The rainy ſeaſon commenced, and the roads were ſhut up by the inundation. The *Rájá* deſcended from the mountains, ſurrounded the *Bengal* army, ſkirmiſhed with them, and cut off their proviſions, till they were reduced to ſuch ſtraights, that they were all, in a ſhort time, either killed or made priſoners.

In the ſame manner MOHAMMED *Shàh*, the ſon of TOGLUC *Shàh*, who was king of ſeveral of the provinces of *Hinduſtàn*, ſent a well-appointed army of a hundred thouſand cavalry to conquer *Asàm*; but they were all devoted to oblivion in that country of enchantment; and no intelligence or veſtige of them remained. Another army was diſpatched to revenge this diſaſter; but when they arrived in *Bengal*, they were panick-ſtruck, and ſhrunk from the enterprize; becauſe if any perſon paſſes the frontier into that diſtrict, he has not leave to return. In the ſame manner, none of the inhabitants of that country are able to come out of it, which is the reaſon that no accurate information has hitherto been obtained relative to that nation. The natives of *Hinduſtàn* conſider them as wizzards and magicians, and pronounce the name of that country in all their incantations and counter-charms. They ſay, that every perſon who ſets his foot there, is under the influence of witchcraft, and cannot find the road to return.

JEIDEJ SING *, the *Rájá* of *Asàm*, bears the title of *Swergì*, or *Celeſtial.* *Swerg*,

* Properly *Jayadhwaja Sinha*, or *the Lion with Banners of Conqueſt.*

in

in the *Hinduſtánì* language, means heaven. That frantick and vain-glorious prince is ſo exceſſively fooliſh and miſtaken, as to believe that his vicious anceſtors were ſovereigns of the heavenly hoſt; and that one of them, being inclined to viſit the earth, deſcended by a golden ladder. After he had been employed ſome time in regulating and governing his new kingdom, he became ſo attached to it, that he fixed his abode in it, and never returned.

In ſhort, when we conſider the peculiar circumſtances of *Asàm*; that the country is ſpacious, populous, and hard to be penetrated; that it abounds in perils and dangers; that the paths and roads are beſet with difficulties; that the obſtacles to the conqueſt of it are more than can be deſcribed; that the inhabitants are a ſavage race, ferocious in their manners, and brutal in their behaviour; that they are of a gigantick appearance, enterprizing, intrepid, treacherous, well armed, and more numerous than can be conceived; that they reſiſt and attack the enemy from ſecure poſts, and are always prepared for battle; that they poſſeſs forts as high as heaven, garriſoned by brave ſoldiers, and plentifully ſupplied with warlike ſtores, the reduction of each of which would require a long ſpace of time; that the way was obſtructed by thick and dangerous buſhes, and broad and boiſterous rivers: when we conſider theſe circumſtances, we ſhall wonder that this country, by the aid of God, and the auſpices of his Majeſty, was conquered by the Imperial army, and became a place for erecting the ſtandard of the faith. The haughty and inſolent heads of ſeveral of the deteſtable *Aſamians*, who ſtretch the neck of pride, and who are devoid of religion, and remote from God, were bruiſed by the hoofs of the horſes of the victorious warriors. The *Muſelman* heroes experienced the comfort of fighting for their religion; and the bleſſings of it reverted to the ſovereignty of his juſt and pious Majeſty.

The *Rájá*, whoſe ſoul had been enſlaved by pride, and who had been bred up in the habit of preſuming on the ſtability of his own government, never dreamt of this reverſe of fortune; but being now overtaken by the puniſhment due to his crimes, fled, as has been before mentioned, with ſome of his nobles, attendants, and family, and a few of his effects, to the mountains of *Cámrùp*. That ſpot, by its bad air and water, and confined ſpace, is rendered the worſt place in the world, or rather it is one of the pits of hell. The *Rájá's* officers and ſoldiers, by his orders, croſſed the *Dhonec*, and ſettled in the ſpacious iſland between that and the *Brahmaputra*, which contains numerous foreſts and thickets. A few took refuge in other mountains; and watched an opportunity of committing hoſtilities.

CA'MR'UP

CA'MR'UP, is a country on the ſide of *Dacſhincul,* ſituated between three high mountains, at the diſtance of four days' journey from *Ghergong.* It is remarkable for bad water, noxious air, and confined proſpects. Whenever the *Rájá* uſed to be angry with any of his ſubjects, he ſent them thither. The roads are difficult to paſs, inſomuch that a foot-traveller proceeds with the greateſt inconvenience. There is one road wide enough for a horſe; but the beginning of it contains thick foreſts for about half a coſs. Afterwards there is a defile, which is ſtony and full of water. On each ſide is a mountain towering to the ſky.

The Imperial General remained ſome days in *Ghergong*, where he was employed in regulating the affairs of the country, encouraging the peaſants, and collecting the effects of the *Rájá.* He repeatedly read the *Khotbeh*, or prayer, containing the name and titles of the Prince of the age, King of Kings, ALEMGEER, Conqueror of the World, and adorned the faces of the coins with the Imperial impreſſion. At this time there were heavy ſhowers, accompanied with violent wind, for two or three days; and all the ſigns appeared of the rainy ſeaſon, which in that country ſets in before it does in *Hinduſtàn.* The General exerted himſelf in eſtabliſhing poſts, and fixing guards, for keeping open the roads and ſupplying the army with proviſions. He thought now of ſecuring himſelf during the rains, and determined, after the ſky ſhould be cleared from the clouds, the lightning ceaſe to illuminate the air, and the ſwelling of the water ſhould ſubſide, that the army ſhould again be ſet in motion againſt the *Rájá* and his attendants, and be employed in delivering the country from the evils of their exiſtence.

The Author then mentions ſeveral ſkirmiſhes, which happened between the *Rájá's* forces and the Imperial troops, in which the latter were always victorious. He concludes thus:

At length all the villages of *Dacſhincul* fell into the poſſeſſion of the Imperial army. Several of the inhabitants and peaſants, from the diffuſion of the fame of his Majeſty's kindneſs, tenderneſs, and juſtice, ſubmitted to his government, and were protected in their habitations and property. The inhabitants of *Uttarcul* alſo became obedient to his commands. His Majeſty rejoiced, when he heard the news of this conqueſt, and rewarded the General with a coſtly dreſs, and other diſtinguiſhing marks of his favour.

The Narrative to which this is a ſupplement, gives a conciſe hiſtory of the military expedition into *Asàm.* In this deſcription the Author has ſtopt at a period, when the Imperial troops had poſſeſſed themſelves of the capital, and were maſters of

of any part of the plain country, which they chofe to occupy or over-run. The fequel diminifhes the credit of the conqueft, by fhowing that it was temporary, and that the *Rájá* did not forget his ufual policy of haraffing the invading army during the rainy feafon : but this conduct produced only the effect of diftreffing and difgufting it with the fervice, inftead of abfolutely deftroying it, as his predeceffors had deftroyed former adventurers. Yet the conclufion of this war is far from weakening the panegyrick which the Author has paffed upon the Imperial General, to whom a difference of fituation afforded an opportunity of difplaying additional virtues, and of clofing that life with heroick fortitude, which he had always hazarded in the field with martial fpirit. His name and titles were, *Mír* JUMLEH, MOAZZIM *Khán*, *Khání Khánán*, *Sipáhì* SA'LA'R.

REMARK.

The preceding account of the *Afamians*, who are probably fuperior in all refpects to the *Moguls*, exhibits a fpecimen of the black malignity and frantick intolerance, with which it was ufual, in the reign of AURANGZ'IB, to treat all thofe whom the crafty, cruel, and avaricious Emperor was pleafed to condemn as infidels and barbarians.

XII.

ON THE MANNERS, RELIGION, AND LAWS OF THE CU'CI'S, OR MOUNTAINEERS OF TIPRA.

Communicated in Perfian by JOHN RAWLINS, *Efq.*

THE inhabitants of the mountainous diftricts to the eaft of *Bengal* give the name of PA'TYA'N to the Being, who created the Univerfe; but they believe that a Deity exifts in every Tree, that the Sun and Moon are Gods, and that, whenever they worfhip thofe fubordinate divinities, PA'TIYA'N is pleafed.

If any one among them put another to death, the Chief of the Tribe, or other perfons

perſons, who bear no relation to the deceaſed, have no concern in puniſhing the murderer; but, if the murdered perſon have a brother, or other heir, he may take blood for blood; nor has any man whatever a right to prevent or oppoſe ſuch retaliation.

When a man is detected in the commiſſion of theft or other atrocious offence, the chieftain cauſes a recompenſe to be given to the complainant, and reconciles both parties; but the Chief himſelf receives a cuſtomary fine; and each party gives a feaſt of pork, or other meat, to the people of his reſpective tribe.

In ancient times it was not a cuſtom among them to cut off the heads of the women, whom they found in the habitations of their enemies; but it happened once, that a woman aſked another, why ſhe came ſo late to her buſineſs of ſowing grain: ſhe anſwered, that her huſband was gone to battle, and that the neceſſity of preparing food and other things for him had occaſioned her delay. This anſwer was overheard by a man at enmity with her huſband; and he was filled with reſentment againſt her, conſidering, that, as ſhe had prepared food for her huſband for the purpoſe of ſending him to battle againſt his tribe, ſo in general, if women were not to remain at home, their huſbands could not be ſupplied with proviſion, and conſequently could not make war with advantage. From that time it became a conſtant practice, to cut off the heads of the enemy's women; eſpecially, if they happen to be pregnant, and therefore confined to their houſes; and this barbarity is carried ſo far, that if a *Cúcì* aſſail the houſe of an enemy, and kill a woman with child, ſo that he may bring two heads, he acquires honour and celebrity in his tribe, as the deſtroyer of two foes at once.

As to the marriages of this wild nation; when a rich man has made a contract of marriage, he gives four or five head of *gayáls* (the cattle of the mountains) to the father and mother of the bride, whom he carries to his own houſe: her parents then kill the *gayáls*, and, having prepared fermented liquors and boiled rice with other eatables, invite the father, mother, brethren, and kindred of the bridegroom to a nuptial entertainment. When a man of ſmall property is inclined to marry, and a mutual agreement is made, a ſimilar method is followed in a lower degree; and a man may marry any woman, except his own mother. If a married couple live cordially together, and have a ſon, the wife is fixed and irremovable; but, if they have no ſon, and eſpecially if they live together on bad terms, the huſband may divorce his wife, and marry another woman.

They have no idea of heaven or hell, the reward of good, or the punifhment of bad actions; but they profefs a belief, that, when a perfon dies, a certain fpirit comes and feizes his foul, which he carries away; and that, whatever the fpirit promifes to give at the inftant when the body dies, will be found and enjoyed by the dead; but that, if any one fhould take up the corfe and carry it off, he would not find the treafure.

The food of this people confifts of elephants, hogs, deer, and other animals; of which if they find the carcaffes or limbs in the forefts, they dry them and eat them occafionally.

When they have refolved on war, they fend fpies, before hoftilities are begun, to learn the ftations and ftrength of the enemy, and the condition of the roads; after which they march in the night; and two or three hours before daylight, make a fudden affault with fwords, lances, and arrows: if their enemies are compelled to abandon their ftation, the affailants inftantly put to death all the males and females, who are left behind, and ftrip the houfes of all their furniture; but, fhould their adverfaries, having gained intelligence of the intended affault, be refolute enough to meet them in battle, and fhould they find themfelves overmatched, they fpeedily retreat and quietly return to their own habitations. If at any time they fee a ftar very near the moon, they fay, 'to-night we fhall undoubtedly be attacked by fome 'enemy;' and they pafs that night under arms with extreme vigilance. They often lie in ambufh in a foreft near the path, where their foes are ufed to pafs and repafs, waiting for the enemy with different forts of weapons, and killing every man or woman, who happens to pafs by: in this fituation, if a leech, or a worm, or a fnake fhould bite one of them, he bears the pain in perfect filence; and whoever can bring home the head of an enemy, which he has cut off, is fure to be diftinguifhed and exalted in his nation. When two hoftile tribes appear to have equal force in battle, and neither has hopes of putting the other to flight, they make a fignal of pacifick intentions, and, fending agents reciprocally, foon conclude a treaty; after which they kill feveral head of *gayáls*, and feaft on their flefh, calling on the Sun and Moon to bear witnefs of the pacification: but if one fide, unable to refift the enemy, be thrown into diforder, the vanquifhed tribe is confidered as tributary to the victors; who every year receive from them a certain number of *gayáls*, wooden difhes, weapons, and other acknowledgements of vaffalage. Before they go to battle they put a quantity of roafted *álu's* (efculent roots like

potatoes)

potatoes) and paſte of rice-flour into the hollow of bambu's, and add to them a proviſion of dry rice with ſome leathern bags' full of liquor: then they aſſemble, and march with ſuch celerity, that in one day they perform a journey ordinarily made by letter-carriers in three or four days, ſince they have not the trouble and delay of dreſſing victuals. When they reach the place to be attacked, they ſurround it in the night, and, at early dawn, enter it, putting to death both young and old, women and children; except ſuch as they chuſe to bring away captive: they put the heads, which they cut off, into leathern bags; and, if the blood of their enemies be on their hands, they take care not to waſh it off. When, after this ſlaughter, they take their own food, they thruſt a part of what they eat into the mouths of the heads, which they have brought away, ſaying to each of them: 'Eat; quench thy 'thirſt; and ſatisfy thy appetite: as thou haſt been ſlain by my hand, ſo may thy 'kinſmen be ſlain by my kinſmen!' During their journey, they have uſually two ſuch meals; and every watch, or two watches, they ſend intelligence of their proceedings to their families: when any one of them ſends word, that he has cut off the head of an enemy, the people of his family, whatever be their age or ſex, expreſs great delight, making caps and ornaments of red and black ropes; then filling ſome large veſſels with fermented liquors, and decking themſelves with all the trinkets they poſſeſs, they go forth to meet the conqueror blowing large ſhells, and ſtriking plates of metal, with other rude inſtruments of muſick. When both parties are met they ſhow extravagant joy, men and women dancing and ſinging together; and, if a married man has brought an enemy's head, his wife wears a head-dreſs with gay ornaments, the huſband and wife alternately pour fermented liquor into each other's mouths, and ſhe waſhes his bloody hands with the ſame liquor, which they are drinking: thus they go revelling, with exceſſive merriment, to their place of abode; and, having piled up the heads of their enemies in the court-yard of their chieftain's houſe, they ſing and dance round the pile; after which they kill ſome *gayáls* and hogs with their ſpears, and, having boiled the fleſh, make a feaſt on it, and drink the fermented liquor. The richer men of this race faſten the heads of their foes on a bambu, and fix it on the graves of their parents; by which act they acquire great reputation. He, who brings back the head of a ſlaughtered enemy, receives preſents from the wealthy of cattle and ſpirituous liquor; and, if any captives are brought alive, it is the prerogative of thoſe chieftains, who were not in the campaign, to ſtrike off the heads of the captives. Their weapons are made by

by particular tribes; for ſome of them are unable to fabricate inſtruments of war.

In regard to their civil inſtitutions; the whole management of their houſehold affairs belongs to their women; while the men are employed in clearing foreſts, building huts, cultivating land, making war, or hunting game and wild beaſts. Five days (they never reckon by months or years) after the birth of a male child, and three days after that of a female, they entertain their family and kinſmen with boiled rice and fermented liquor; and the parents of the child partake of the feaſt. They begin the ceremony with fixing a pole in the court yard; and, then, killing a *gayál* or a hog with a lance, they conſecrate it to their deity; after which all the party eat the fleſh and drink liquor, cloſing the day with a dance and with ſongs. If any one among them be ſo deformed, by nature or by accident, as to be unfit for the propagation of his ſpecies, he gives up all thought of keeping houſe, and begs for his ſubſiſtence, like a religious mendicant, from door to door, continually dancing and ſinging. When ſuch a perſon goes to the houſe of a rich and liberal man, the owner of the houſe uſually ſtrings together a number of red and white ſtones, and fixes one end of the ſtring on a long cane, ſo that the other end may hang down to the ground; then, paying a kind of ſuperſtitious homage to the pebbles, he gives alms to the beggar; after which he kills a *gayál* and a hog, and ſome other quadrupeds, and invites his tribe to a feaſt: the giver of ſuch an entertainment acquires extraordinary fame in the nation; and all unite in applauding him with every token of honour and reverence.

When a *Cúcì* dies, all his kinſmen join in killing a hog and a *gayál*; and, having boiled the meat, pour ſome liquor into the mouth of the deceaſed, round whoſe body they twiſt a piece of cloth by way of ſhroud: all of them taſte the ſame liquor as an offering to his ſoul; and this ceremony they repeat at intervals for ſeveral days. Then they lay the body on a ſtage, and, kindling a fire under it, pierce it with a ſpit and dry it: when it is perfectly dried, they cover it with two or three folds of cloth; and, encloſing it in a little caſe within a cheſt, bury it under ground. All the fruits and flowers, that they gather within a year after the burial, they ſcatter on the grave of the deceaſed: but ſome bury their dead in a different manner; covering them firſt with a ſhroud, then with a mat of woven reeds, and hanging them on a high tree. Some when the fleſh is decayed, waſh the bones, and keep them dry in a bowl, which they open on every ſudden emergence; and, fancying

fancying themſelves at a conſultation with the bones, purſue whatever meaſures they think proper; alleging, that they act by the command of their departed parents and kinſmen. A widow is obliged to remain a whole year near the grave of her huſband; where her family bring her food: if ſhe die within the year, they mourn for her; if ſhe live, they carry her back to her houſe, where all her relations are entertained with the uſual feaſt of the *Cúcì's*.

If the deceaſed leave three ſons, the eldeſt and the youngeſt ſhare all his property; but the middle ſon takes nothing: if he have no ſons, his eſtate goes to his brothers, and, if he have no brothers, it eſcheats to the chief of the tribe.

NOTE.

A party of *Cúcì's* viſited the late CHARLES CROFTES, Eſq. at *Jáfarabád* in the ſpring of 1776, and entertained him with a dance: they promiſed to return after their harveſt, and ſeemed much pleaſed with their reception.

XIII.

ON THE SECOND CLASSICAL BOOK OF THE CHINESE. *See the Works of Sir William Jones, Vol. I. p. 365.*

A LETTER TO THE PRESIDENT FROM A YOUNG CHINESE.

SIR,

I RECEIVED the favour of your letter dated the 28th March, 1784, by Mr. *Cox*. I remember the pleaſure of dining with you in company with Captain *Blake* and Sir *Joſhua Reynolds*; and I ſhall always remember the kindneſs of my friends in *England*.

The

The *Chineſe* book, *Shi King,* that contains three hundred poems, with remarks thereon, and the work of *Con-fu-tſu*, and his grandſon, the *Tai Ho*, I beg you will accept: but to tranſlate the work into *Engliſh* will require a great deal of time, perhaps three or four years; and I am ſo much engaged in buſineſs, that I hope you will excuſe my not undertaking it.

If you wiſh for any books or other things from *Canton*, be ſo good as to let me know, and I will take particular care to obey your orders.

Wiſhing you health,

I am, Sir,

Your moſt obedient humble Servant,

WHANG ATONG.

A TABLE

L E

E S, &c.

8th. From			10th. From		
انْتِظَام	regulation,	نظم	اِسْتِقْبَال	a meeting,	قبل
مُنْتَظِر	expecting,	نظر	مُسْتَحْفِظ	protecting,	حفظ
مُنْتَظَم	regulated,	نظم	مُسْتَحْكَم	confirmed,	حكم
اهْتِمَام	solicitude,	همّ	اِسْتِقْلَال	independency,	قلّ
مُشْتَدّ	wearing out,	شدّ	مُسْتَقِلّ	absolute,	قلّ
مُخْتَلّ	depraved,	خلّ	مُسْتَمِرّ	past,	مرّ
ائْتِمَان	confidence,	امن	اِسْتِئْصَال	extirpation,	اصل
مُؤْتَمِن	confiding,	امن	مُسْتَأْدِب	studying civility,	ادب
مُؤْتَمَن	confided,	امن	مُسْتَأْصَل	eradicated,	اصل
اِفْتِئَال	auguration,	فال			
اِبْتِدَاء	commencement,	بدأ	اِسْتِبْرَاء	purification,	براء
مُبْتَدِي	beginning,	بدأ	مُسْتَبْرِي	desiring to be free,	براء
مُبْتَدَا	begun,	بدأ			
اِتِّحَاد	union,	وحد	اِسْتِيطَان	residence,	وطن
مُتَّصِل	approaching,	وصل	مُسْتَوْطِن	residing,	وطن
مُتَّحَد	united,	وحد	مُسْتَوْدَع	deposited,	ودع

A TABLE,

Containing Examples *of all the different ſpecies of* Infinitives *and* Participles *that are derived from* Triliteral Verbs, *in the form in which they are uſed in the* Perſian, *and in the Language of* Hindoſtan.

ARABIC TRILITERAL VERBS.

Class		Form	Conjugation 1ſt.	From	2d.	From	3d.	From	4th.	From
I. With three different radicals, none of them, as نعل	اوي	Infn.	نَعْل action,	نعل	تَقْصِيْر fault,	قصر	مُخَالَفَت oppoſition,	خلف	اظهار demonſtration,	ظهر
		Part. act.	حَاکِم judging,	حکم	مُصَدِّع importuning,	صدع	مُطَابِق conforming,	طبق	مُہْلِک deſtroying,	هلک
		Part. paſ.	مَقْتُول ſlain,	قتل	مُکَسَّر broken,	کسر	مُنَاسِب connected,	نسب	مُطْلَق abſolved,	طلق
II. With the 2d and 3d radicals the ſame, but none of them, as عزّ	اوي	Infn.	عِزّ honor,	عزّ	تَکْرِير repetition,	کرّ	مُمَادَّت extenſion,	مدّ	اقرار confirmation,	قرّ
		Part. act.	حَاجّ performing the pilgrimage,	حجّ	مُحَقِّق certifying,	حقّ	مُمَادّ extending,	مدّ	مُعِزّ honoring,	عزّ
		Part. paſ.	مَذْمُوم blamed,	ذمّ	مُکَرَّر repeated,	کرّ	مُمَادّ oppoſed,	مدّ	مُعَدّ prepared,	عدّ
III. With ا for the 1ſt radical, as	ادب	Infn.	اَدَب civility,	ادب	تَأْدِيب inſtruction,	ادب	مُؤَاخَرَت procraſtination,	اخر	ایثار preſentment,	اثر
		Part. act.	آکِل eating,	اکل	مُؤَصِّل eſtabliſhing,	اصل	مُؤَارِف lying contiguous,	ارف	مُؤَکِّل giving to eat,	اکل
		Part. Paſ.	مَأْخُوذ taken,	اخذ	مُؤَدَّب well educated,	ادب	مُؤَانَس familiarized,	انس	مُؤَلَّم pained,	الم
IV. With ا for the 2d radical, as	شان	Infn.	شَأْن condition,	شان	تَلْيِيْم mitigation,	لام	مُلَاءَمَت complacency,	لام	اِسَالَت compliance,	سال
		Part. act.	سَائِل interrogating,	سال						
		Part. paſ.	مَسْئُول ſought,	سال	مُلَأَّم clothed in mail	لام			مُفْأَم filled,	فام
V. With ا for the 3d radical, as	برا	Infn.	بُرَاء relief, cure,	برا	تَهْنِيَت congratulation,	هنا			اِبْرَاء relief,	برا
		Part. act.	بَارِي creating,	برأ	مُبَرِّي free,	براء			مُبْنِي cauſing to build,	بنا
		Part. paſ.	مَبْرِي freed,	برأ	مُهَنَّا congratulated,	هنا			مُنْشَا erected,	نشا
VI. With و for the 1ſt radical, as	وضع	Infn.	وَضْع ſituation,	وضع	تَوْفِيق concurrence,	وفق	مُوَاظَبَت perſeverance,	وظب	ایجاب neceſſity,	وجب
		Part. act.	وَاصِل arriving,	وصل	مُؤَکِّد confirming,	وکد	مُوَافِق agreeing,	وفق	مُوجِب cauſing,	وجب
		Part. paſ.	مَوْضُوع placed,	وضع	مُوَفَّق aſſiſted	وفق			مُوجَد confirmed,	وجد
VII. With و for the 2d radical, as	قول	Infn.	قَوْل ſpeech,	قول	تَطْوِيل prolixity,	طول	مُدَاوَمَت continuation,	دوم	اِجَازَت permiſſion,	جوز
		Part. act.	قَايِل ſpeaking,	قول	مُنَوِّر illuminating,	نور	مُقَاوِم riſing againſt another,	قوم	مُقِيم continuing,	قوم
		Part. paſ.	مَخُوف dreaded,	خوف	مُطَوَّل extended,	طول			مُجَاز permitted,	جوز
VIII. With و for the 3d radical, as	سهو	Infn.	سَهْو omiſſion,	سهو	تَرْبِيَت education,	ربو	مُلَاقَات interview,	لقو	اِنْشَا compoſition,	نشو
		Part. act.	عَادِي tranſgreſſing,	عدو	مُرَبِّي inſtructing,	ربو	مُلَاقِي meeting,	لقو	مُنْشِي a Moonshy, a composer, composing,	نشو
		Part. paſ.	مَدْعُو & مدعي ſolicited,	دعو	مُرَبَّا inſtructed,	ربو			مُلْقَا thrown,	لقو
IX. With ي for the 1ſt radical, as	يقن	Infn.	يَقِن certainly,	يقن	تَيْسِير the act of facilitating,	يسر	مُبَايَمَت the act of bleſſing,	يمن	اِيقَان certain knowledge,	يقن
		Part. act.	يَامِن proſpering,	يمن	مُيَمِّن enjoying proſperity,	يمن			مُوقِن certain,	يقن
		Part. paſ.	مَيْمُون favoured by fortune,	يمن	مُيَسَّر obtained,	يسر				
X. With ي for the 2d radical, as	سير	Infn.	سَيْر the act of walking out,	سير	تَغْيِير alteration,	غير	مُغَايَرَت the act of changing,	غير	اضافه relation,	ضيف
		Part. act.	مَايِل inclining,	ميل	مُخَيِّر chooſing,	خير	مُغَايِر oppoſing,	غير	مُخَيِّم pitching a tent,	خيم
		Part. paſ.	مَبِيع ſold,	بيع	مُغَيَّر changed,	غير			مُضَاف annexed,	ضيف
XI. With ي for the 3d radical, as	بغي	Infn.	بَغْي injuſtice,	بغي	تَثْنِيَه the act of doubling,	ثني	مُکَافَات compenſation,	نفي	انها the act of announcing,	نهي
		Part. act.	قَاضِي judging,	قضي	مُصَلِّي praying,	صلي	مُنَافِي repugnant,	نفي	مُنْهِي reporting,	نهي
		Part. paſ.	مَقْضِي determined,	قضي	مُثَنَّا doubled,	ثني			مُغَشَّا covered over,	غشي
XII. With ا for the 1ſt, and و the 2d radical, as	اوب	Infn.	اَوْب attract,	اوب	تَأْوِيل explication,	اول			مُؤَوَّد weighed down,	اود
		Part. act.	آيِد troubleſome,	اود	مُؤَوِّل explaining,	اول				
		Part. paſ.	مَأْوُوف hurt,	اوف	مُؤَوَّل tranſlated,	اول				

A TABLE CONTAINING EXAMPLES, &c.

5th.

		From
تكبّر	arrogance,	كبر
متصرّف	possessing,	صرف
متعلّق	annexed,	علق
تجسّس	investigation,	جسّ
متردّد	opposing,	ردّ
متضرّر	injured,	ضرّ
تأمّل	deliberation,	امل
متأخّر	retarding,	اخر
		فال
تسئّل	the act of begging,	سال
متسئّل or متسائل	begging,	سال
تهنّو	refreshing with good food,	هنا
متبرّي	freeing,	برا
متهنّا	congratulated,	هنا
توقّف	delay,	وقف
متوجّه	giving countenance,	وجه
متوقّع	*expected,*	وقع
تصوّر	the act of imagining,	صور
متصوّر	imagining,	صور
متصوّر	imagined,	صور
تعدّى	violence,	عدو
متعدّي	trangressing,	عدو
متلقّا	met,	لقو
تيمّن	the act of making happy,	يمن
متيقّن	ascertaining,	يقن
متيقّظ	roused,	يقظ
تقيّد	application,	قيد
متخيّر	wondering,	خير
متعيّن	appointed,	عين
تعصّى	rebellion,	عصى
متمنّى	wishing,	منى
متمنّا	wished,	منى
تأوّل	exposition,	اول
متأوّل	interpreting,	اول
متأوّل	translated,	اول

6th.

		From
تغافل	negligence,	غفل
متعاقب	succeeding another,	عقب
متباعد	removed,	بعد
تداقّ	mutual search,	دقّ
تحاجّ	disputation,	حجّ
مترادّ	opposing each other,	ردّ
متماسّ	touched,	مسّ
تساءل	expostulation,	سال
متسائل	begging,	سال
متفائل	portended,	فال
متباهي	boasting mutually,	بها
تواضع	submission,	وضع
متواتر	succeeding another,	وتر
متواصل	*united,*	وصل
تجاوز	excess,	جوز
متجاوز	exceeding,	جوز
متعاور	received in loan,	عور
تلافي	prosecution,	لفو
متعالى	raising on high,	علو
تياجر	the act of revolting,	يجر
متياجر	revolting,	يجر
متياجر	revolted,	يجر
تمايل	inflexion,	ميل
متغاير	altering,	غير
تعالي	exaltation,	على
متناهي	completing,	نهى

7th.

		From
انكسار	contrition,	كسر
مندرج	comprehending & comprehended,	درج
انحلال	solution,	حل
منهلّ	flowing profusely,	هل
انقياد	submission,	قود
منقاد	obeying,	قود
انجلا	brightness,	جلو
منعدي	contagious,	عدو
انقياد	submission,	قيد
منقاد	obeying,	قيد
انقضا	expiration of time,	قضى
منقضي	coming to a conclusion,	قضي

8th.

		From
انتظام	regulation,	نظم
منتظر	expecting,	نظر
منتظم	regulated,	نظم
اهتمام	solicitude,	همّ
مشتدّ	wearing out,	شدّ
مختلّ	depraved,	خلّ
ايتمان	confidence,	امن
موتمن	confiding,	امن
موتمن	confided,	امن
افتيال	auguration,	فال
ابتدا	commencement,	بدأ
مبتدي	beginning,	بدأ
مبتدا	begun,	بدأ
اتّحاد	union,	وحد
متّصل	approaching,	وصل
متّحد	united,	وحد
اشتياق	affection,	شوق
مشتاق	desiring,	شوق
مشتاق	desired,	شوق
التقا	conference,	لقو
ملتقي	coming to meet,	لقو
مبتلا	afflicted,	بلو
ايتقان	the act of ascertaining,	يقن
اختيار	option,	خير
مختار	choosing,	خير
مختار	chosen,	خير
اكتفا	sufficiency,	كفى
مقتضي	requiring,	قضي
مقتضا	required,	قضى
موتاب	returning,	اوب
موتاب	returned,	اوب

10th.

		From
استقبال	a meeting,	قبل
مستحفظ	protecting,	حفظ
مستحكم	confirmed,	حكم
استقلال	independency,	قلّ
مستقلّ	absolute,	قلّ
مستمرّ	past,	مرّ
استيصال	extirpation,	اصل
مستأدب	studying civility,	ادب
مستأصل	eradicated,	اصل
استبرا	purification,	براء
مستبري	desiring to be free,	براء
استيطان	residence,	وطن
مستوطن	residing,	وطن
مستودع	deposited,	ودع
استصواب	*approbation,*	صوب
مستطيل	exalting himself,	طول
مستعار	received in loan,	عور
استدعا	the act of petitioning,	عوں
مستعدي	desiring aid to oppose,	دعو
مستدعا	solicited,	دعو
استيسار	the act of facilitating,	يسر
مستيقن	exploring,	يقن
استمالت	the act of soothing,	ميل
مستفيد	acquiring gain,	فيد
مستزاد	increased,	زيد
استقضا	appeal for judgement,	قضي
مستغني	enjoying plenty,	غني
مستثنا	excepted,	ثني
مستاور	taking fright,	اور
مستاور	affrighted,	اور

A TABLE containing EXAMPLES, &c.

FROM ARABIC TRILITERAL VERBS.

Conjugation			1st.	From	2d.	From	3d.	From	4th.	From
XIII. With ا for the 1st, and ي as the 2d radical,	ايد	Infin.	أَيْدٌ strength,	ايد	تَأْيِيْدٌ confirmation,	ايد			مُؤَيِّدٌ confirming,	ايد
		Part. act.	آيِدٌ potent,	ايد	مُؤَيِّدٌ confirming,	ايد			مُؤْيَدٌ confirmed,	ايد
		Part. paſ.	مَأْيُوْسٌ made deſperate,	ايس	مُؤَيَّدٌ confirmed,	ايد			إِسَاءَتٌ evil doing,	سوء
XIV. With ا the 3d, and و the 2d radical, as	سوء	Infin.	سُوْءٌ depravity,	سوء	تَسْوِيَةٌ accuſation,	سوء	مُسَاۤيَئَتٌ evil,	سوء	مُسِئٌ ſinning,	سوء
		Part. act.								
		Part. paſ.								
XV. With ا the 3d, and ي the 2d radical, as	جيء	Infin.	هَيْءٌ the act of calling to eat and drink,	هيء	تَهْيِئَةٌ preparation,	هيء				
		Part. act.	جَاۤئِيٌ coming,	جيء	مُهَيِّءٌ preparing,	هيء				
		Part. paſ.			مُهَيَّأٌ prepared,	هيء				
XVI. With ا the 1st, and و the 2d radical,	اخو	Infin.	أَسْوٌ medicine,	اسو	تَأْبِيَةٌ the act of calling "father,"	ابو	مُؤَاخَاتٌ the cultivation of friendſhip,	اخو		
		Part. act.	آسٍ curing,	اسو	مُؤَسِّيٌ giving comfort,	اسو			مُؤْسِيٌ giving comfort,	اسو
		Part. paſ.	مَأْسُوٌ cured,	اسو						
XVII. With ا the 1st, and ي the 3d radical,	اذي	Infin.	أَذًى trouble,	اذي	تَأْدِيَةٌ performance,	ادى	مُوَازَاتٌ parallelism,	ازي	إِيذَاۤ moleſtation,	اذي
		Part. act.	آذِيٌ taking trouble,	اذي	مُؤَدِّيٌ performing,	ادي	مُوَازِيٌ parallel,	ازي	مُؤْذِيٌ moleſting,	اذي
		Part. paſ.			مُؤَدًّى performed,	ادي	مُرَايَاتٌ diſſimulation,	راي	إِرَاءَتٌ the act of ſhewing,	راي
XVIII. With ا the 2d, and ي the 2d radical, as	راي	Infin.	رَأْيٌ obſervation,	راي			مُرَائِيٌ diſſembling,	راي		
		Part. act.	رَائِيٌ obſerving,	راي						
		Part. paſ.	مَرْئِيٌ obſerved,	راي			مُوَافَاتٌ the performance of what is due,	وفي	إِيفَاۤ the performance of what is ſtipulated,	وفي
XIX. With و the 1st, and ي the 2d radical,	وقي	Infin.	وَقْيٌ protection,	وقي	تَوْقِيَةٌ the act of protecting,	وقي	مُوَافِيٌ performing,	وفي	مُوْصِيٌ making a will,	وصى
		Part. act.	وَاقِيٌ protecting,	وقي	مُوَقِّيٌ powerful,	وقي			مُوْفًا performed,	وفي
		Part. paſ.	مَوْقِيٌ protected,	وقي	مُوصًا directed by a will,	وصي	مُيَادَاتٌ payment out of one's own hand,	يدي		
XX. With ي the 1st, and ي the 3d radical,	يدي	Infin.	يَدْيٌ power,	يدي					مُوْدِيٌ beneficent,	يدي
		Part. act.							مُوْدًا benefited,	يدي
		Part. paſ.	مَيْدِيٌ hurt in the hand,	يدي			مُسَاوَاتٌ the act of making equal,	سوي	مُقْوِيٌ having ſtrong cattle,	قوي
XXI. With و the 2d, and ي the 3d radical,	قوي	Infin.	قُوَّتٌ ſtrength,	قوي	تَقْوِيَتٌ corroboration,	قوي	مُسَاوِيٌ equal,	سوي		
		Part. act.	قَاوِيٌ ſeizing,	قوي	مُقَوِّيٌ ſtrengthening,	قوي				
		Part. paſ.	مَرْوِيٌ narrated,	روي	مُقَوًّا ſtrengthened,	قوي			إِحْيَاۤ vivification,	حيي
XXII. With ي the 2d and ي the 3d radical, as	حيي	Infin.	حَيَاتٌ life,	حيي	تَحِيَّتٌ ſalutation,	حيي			مُحْيِيٌ vivifying,	حيي
		Part. act.	حَاۤيٌ living,	حيي	مُحَيِّيٌ ſaluting,	حيي				
		Part. paſ.								
XXIII. With و for the 1st, and ي the 2d radical,	اوي	Infin.	أَوْيٌ vid. gol.							
		Part. act.	آوِيٌ vid. gol.							
		Part. paſ.								
XXIV. With و the 1st, and ي the 3d radical,	واي	Infin.	وَأْيٌ promiſe,	واي						
		Part. act.								
		Part. paſ.								

A TABLE CONTAINING EXAMPLES, &c.

5th.	From	6th.	From	7th.	From	8th.	From	10th.	From
تَأَيُّد confirmation,	ايد								
مُتَأَيِّد confirming,	ايد								
مُتَأَيِّس made soft,	ايس								
تَهَيُّؤ preparation,	هيء								
مُتَهَيِّئ preparing,	هيء								
مُتَهَيَّأ prepared,	هيء								
تَأَخِّي behaviour of a brother,	اخو	تَآخِي mutual fraternity,	اخو						
مُتَأَخِّي acting like a brother,	اخو	مُتَآخِي behaving mutually like brothers,	اخو			مُوتَسِي imitating,	اسو		
تَأَنِّي caution,	اني							مُسْتَأْنِي waiting with patience,	اني
مُتَأَنِّي cautious,	اني								
		مُتَرَائِي looking at one another,	راي						
تَوَفِّي the act of [illegible]	وفي	تَوَالِي a series of succession,	ولي			اِتِّقَا abstinence,	وقي	اِسْتِيفَا the act of fulfilling,	وفي
مُتَوَفِّي giving up life,	وفي	مُتَوَالِي following in succession,	ولي			مُتَّقِي abstinent,	وقي	مُسْتَوْفِي fulfilling,	وفي
مُتَوَفَّا deceased,	وفي								
تَقَوِّي superior strength	قوي	تَقَاوِي the act of impowering,	قوي			اِسْتِوَا equality,	سوي		
مُتَقَوِّي having great strength,	قوي	مُتَقَاوِي impowering,	قوي			مُسْتَوِي equal,	سوي		
								اِسْتِحْيَا modesty.	حيي
مُتَأَوِّي collecting together,	اوي					مُوتَوِي receiving into his house,	اوي		

توفي the act of ...

مُتَوَفّي giving up life,

مُتَوَفّا deceased,

تَقَوّي superior strength

مُتَقَوّي having great strength,

مُتَاوّي collecting together,

ADVERTISEMENT.

EXAMPLES of derivatives from Arabick Quadriliterals rarely occur in the Perſian language; and from the 9th, 11th, 12th, and 13th Conjugations of Triliterals there are none to be met with. I have therefore confined my obſervations to the nine Conjugations included in the Table. And although particular ſenſes and uſes are aſſigned to each of theſe by Grammarians (which may be ſeen in Mr. Richardſon's Gram. p. 65), it is at the ſame time to be obſerved, that they are nevertheleſs frequently uſed in other ſenſes; many of them retaining the ſimple ſignification of their primitives: and that every root does not extend through every Conjugation; but that ſome are uſed in one form; many in ſeveral; none in all.

Theſe obſervations are applicable to the preſent ſubject; and the derivatives of ſuch conjugations as are more frequently uſed in the Arabick ſeem alſo to be more frequently than any other introduced into the Perſian.

Where no example of any particular form is to be found in Golius and Meninſki I have left a blank in the Table, which may be filled up whenever any can be met with.

With regard to the examples which I have brought to illuſtrate the following Rules, they are ſuch as came firſt to hand; and *one* example of an Infinitive or Participle is intended as a repreſentation of the Infinitives and Participles of every ſpecies and conjugation. To have attempted a complete ſyſtem of examples would have carried me far beyond the limits of my preſent undertaking.

Of ARABICK INFINITIVES.

I. Their Maſculine Singulars are uſed in the Perſian as Subſtantives; and in every reſpect ſerve the ſame purpoſes, and are ſubject to the ſame rules of conſtruction, as Subſtantives originally Perſian.

Ex. 1. governing a ſub. fol.	اظهارِ يكانكي	demonſtrations of unanimity.
2. agreeing with an ad. fol.	استعجالِ تمام	great haſte.
3. agreeing with a part. paſ. fol.	تحريرِ مسطور	the ſaid writing.
4. nominatives to verbs,	نظر براين بود	my view was this.

5. governed

Ex. 5.	governed by verbs,	احتظاظِ وافر يافت	he received great delight.
6.	governed by a prepoſition,	بعد از تقديمِ مراسم	after performing the duties.
7.	united by a conjunction,	اقبال و اجلال	proſperity and ſplendor.
8.	rendered definite by affixing ي	اتّحادي كه در ميان بود	the union that was, between.

II. Their Maſculine Plurals are uſed in the Perſian as Subſtantives ; and in every reſpect ſerve the ſame purpoſes, and are ſubject to the ſame rules of conſtruction, as Subſtantives originally Perſian.

Ex. 1.	governing a ſub. fol.	اخلاقِ مردم	the diſpoſitions of men.
2.	agreeing with an ad. fol.	افعالِ نيک	good actions.
3.	agreeing with a part. paſ. fol.	اطوارِ مسطور	the qualifications deſcribed.

III. Their Feminine Singulars are uſed in the Perſian as Subſtantives ; and in every reſpect ſerve the ſame purpoſes, and are ſubject to the ſame rules of conſtruction, as Subſtantives originally Perſian.

Ex. 1.	nominatives to verbs,	اجازت است	there is permiſſion.
2.	governing a ſub. fol.	معاملتِ ملک	the buſineſs of the empire.
3.	agreeing with an ad. fol.	مقاتلهٔ عظيمه	a bloody battle.
4.	agreeing with a part. paſ. fol.	مكاتبهٔ مرقومه بدوستي	a letter written in friendſhip.

IV. Their Feminine Plurals are uſed in the Perſian as Subſtantives ; and in every reſpect ſerve the ſame purpoſes, and are ſubject to the ſame rules of conſtruction, as Subſtantives originally Perſian.

Ex. 1.	governing a ſub. fol.	توجهاتِ دوستان	the civilities of friends.
2.	agreeing with an ad. fol.	معاملاتِ كلّي	public affairs.
3.	agreeing with a part. paſ. fol.	تكليفاتِ مزبور	the ſaid burthens.

V. The

V. The Infinitives of the firſt Conjugation of Tranſitive Verbs are regularly of the form exhibited in the Table. But thoſe of Intranſitives are reducible to no proper rule without innumerable exceptions. Grammarians make of them in all thirty-two different forms, which may be ſeen in Mr. Richardſon's Grammar, p. 92: but for theſe irregularities he juſtly obſerves that a dictionary is the only proper guide. Theſe Infinitives, both Singulars and Plurals, are introduced freely into the Perſian as Subſtantives.

Ex. governing another ſub. fol. وصولِ مکتوب the arrival of the letter, &c. &c.

OF ARABICK PARTICIPLES ACTIVE.

I. Their Maſculine Singulars are uſed in the Perſian as Participles, as Subſtantives, and as Adjectives.

Ex. 1. as participles with a verb fol. منتظر ماند he remained expecting.
طالع و لامع باد be ſhining and blazing.

2. as ſub. governing another ſub. fol. حاکمِ شهر governor of the city.
موجبِ خوشنودی cauſing gladneſs—the cauſe of gladneſs.
مصنّفِ این کتاب compoſing this book—the author of this book.
مطابقِ شرعِ شریف following the noble law—follower of the noble law.

3. as an ad. qualifying a ſub. مردم قابل an able man.

4. following another ſub. ſignifying the ſame thing حضرت خالق God the creator.

5. agreeing with an ad. fol. عاملِ نیک a good agent.

6. agreeing with a part. paſ. fol. حاکمِ مستقلّ abſolute judge.

7. governed by a verb, قاتلرا کشت he put the murderer to death.

8. nominatives to verbs, اگر عاشق صادق است if the lover be ſincere.

Ex. 9. with a prepoſn. fol. an uncommon conſtruction, مشتمل بر مصادقت containing friendſhip.

II. Their Maſculine perfect Plurals are uſed in the Perſian as Subſtantives, in the form of the oblique caſe which terminates in ين. But they do not ſeem to be uſed in the form of the nominative which terminates in ون.

Ex. 1. governed by a ſub. going before, علمِ اوّلين وآخرين the knowledge of the moderns and ancients.

قومِ مسلمين the ſect of the faithful.

III. Their Maſculine imperfect Plurals are uſed in the Perſian as Subſtantives.

Ex. 1. governing a ſub. fol. حکّامِ حال و استقبال officers of the preſent and future.

2. agreeing with an ad. fol. عمالِ جديد و قديم the new and old agents.

IV. Their Feminine Singulars are uſed in the Perſian as Participles, as Subſtantives, and as Adjectives.

Ex. 1. as a part. act. with a verb fol. حامله است ſhe is pregnant.

2. as a ſub. governing another fol. مالكهٔ ملك queen of the empire.

3. as an ad. qualifying a ſub. going before زنِ حامله a pregnant woman.

4. as a ſub. qualified by an ad. following, مشفقهٔ مهربان kind friend.

5. as a ſub. qualified by a part. paſ. following, صاحبهٔ موصوفه accompliſhed lady.

V. Their Feminine perfect Plurals are uſed in the Perſian as Subſtantives expreſſing things without life.

Ex. 1. governing a ſub. fol. واقعاتِ زمان the incidents of time.

2. agreeing with an ad. fol. وارداتِ ناگهاني unforeſeen events.

OF

OF ARABICK PARTICIPLES PASSIVE.

I. Their Maſculine Singulars are uſed in the Perſian as Participles Paſſive, as Subſtantives, and as Adjectives.

Ex. 1.	as a part. paſ.	جملگي همت مصروف بران است	the ſum of my deſire is beſtowed on that.
		ظلِّ شفقت ممدود باد	be the ſhade of clemency extended.
2.	as a ſub. governing another fol. it,	مشهودِ ضميرِ منير ميكرداند	I make it the perception (i. e. the thing perceived) of your enlightened ſoul; i. e. I repreſent it, &c.
		مرغوبِ طبايع	the deſire (i. e. the thing deſired) of the ſouls.
3.	as an ad. qualifying a ſub. going before,	بندهٔ مظلوم	the injured ſlave.
4.	joined with another ſub. by a conjunction,	مقصود و مرام	intention and deſign.
5.	governed by verbs,	خلايق را محظوظ كرداند	make the people glad.
6.	nominatives to verbs,	مقصودِ او شان بر اين بود	their intention was this.

II. Their Maſculine perfect Plural does not ſeem to be uſed in the Perſian, either in the form of the nominative or the oblique caſe.

III. Their Feminine Singulars are uſed in the Perſian as Subſtantives, and as Adjectives.

Ex. 1.	as a ſub. governing another fol. it,	معشوقهٔ من	my beloved, i. e. the beloved of me.
2.	as a ſub. agreeing with a part. paſ. following,	معشوقهٔ مذكوره	the ſaid beloved woman.
3.	as an ad. agreeing with a ſub. going before,	والدهٔ مخدومه	reſpected mother.

IV.

IV. Their Feminine perfect Plurals are used in the Persian as Substantives, to express things without life.

Ex. 1. governing a sub. fol. مطلوبات آن مهربان the demands of that friend.

2. agreeing with an ad. fol. مقدمات شرعي law affairs.

V. The Active and Passive Participles of Transitive verbs form, with a following substantive having the Article ال prefixed to it, compounds corresponding to that of خوب روي, which are used in the Persian as Substantives, and as Adjectives.

Ex. 1. as a sub. a nominative to the verb, متعذّر الفصل است he evades a decision.

2. as an ad. qualifying a sub. شخص واجب التعظيم a person deserving respect.

قلم مقطوع اللسان a pen cut short in the point.

OF ARABICK ADJECTIVES RESEMBLING PARTICIPLES.

I. The forms حَسَنْ صَعْب شَرِير represent three species of Arabick words which are derived from Intransitive verbs; and called by Arabick Grammarians, Adjectives resembling Participles. The Singulars of these forms are used in the Persian both as Adjectives and Substantives.

Ex. 1. as a sub. qualified by the pronoun dem. آن عزيز that respectable person.

2. with a verb, شرير است he is wicked.

3. as an ad. qualifying a sub. دوست قديم an old friend.

II. Their Plurals are used in the Persian as Substantives.

Ex. 1. governing a sub. fol. حكماي يونان the learned men of Greece.

2. agreeing with an ad. fol. شرفاي پاك نهاد noblemen of integrity.

III.

III. Thefe three forms of Adjectives refembling Participles, form, with a following Subftantive having the Article ال prefixed to it, compounds correfponding to that of خوبروي, which are ufed in the Perfian both as Subftantives and Adjectives.

Ex. 1. as a fub. qualified by the pro. demonft. آن حسن الوجه that beauty.
آن قديم الخدمت that old fervant.
2. as a fub. qualified by an ad. fol. قديم الخدمتِ مذكور the faid old fervant.
3. as an ad. qualifying a fub. going before, مردِ قديم الخدمت a man of long fervice.

OF PARTICIPLES EXPRESSING THE SENSE OF THEIR PRIMITIVES IN A STRONGER DEGREE.

I. The forms نَصِير نَصَّار نَصُور نَصِر مِنصَار are Participles which exprefs the fenfe of their primitives in a ftronger degree; and are fometimes ufed in the Perfian as Adjectives.

Ex. 1. agreeing with a fub. going before, ادويهٔ قتّاله a poifonous medicine.
2. agreeing with a verb. fol. صبور است he is full of patience.

صريب Is the form of a Participle expreffing the fenfe of the primitive in a lefs degree; but it does not feem to be ufed in the Perfian.

OF ARABICK SUBSTANTIVES.

I. The Arabick Noun of time and place are frequently employed in the Perfian; and the following lift exhibits the forms of fuch as are derived from the firft Conjugations of the different fpecies of Triliterals.

CONJUGATION

CONJUGATION 1ſt.

NOUNS OF TIME AND PLACE FROM TRILITERALS.

	FROM		Roots.
I.	مَكْتَب	the time and place of writing,	كتب
II.	مَقَرّ	a place of reſt, reſidence,	قرّ
III.	مَأْمَن	a place of ſafety,	امن
V.	مَبْدَا	the place and time of beginning,	بداء
VI.	مَوْضِع	place, opportunity,	وضع
VII.	مَقَام	the place and time of ſtanding,	قوم
VIII.	مَدْعَا	the place or object of deſire,	دعو
X.	مَبِيع	the place and time of ſelling,	بيع
XI.	مَرْمَا	the place and time of throwing,	رمي
XII.	مَآب	the place of return, the center,	اوب
XV.	مَجِي	the time of coming—arrival,	جي
XVII.	مَأتَا	the place, the way of approaching,	اتي
XVIII.	مَرْءا	the place of looking, beholding,	راي
XIX.	مَوْلَاومَوْلِي	the place of power—and thus Lord, Maſter, &c.	ولي
XXI.	مَهْوَا	a place of diviſion—the interval,	هوي
XXII.	مَحْيَا	the time and place of living,	حي
XXIII.	مَأوَاومَأوِي	a place of habitation—refuge,	اوي

——— To expreſs the *place* more particularly, ة is ſometimes added to the common form as مقبرة a burning place.

I. The

II. The Noun of time and place from the derivative Conjugations is exactly the ſame with the Participle Paſſive; and is alſo uſed in the Perſian.

Ex. 1. a part. Paſſive from the 10th conjugation, مستودع depoſited—alſo a place of depoſit.

III. The Perſian language has terms proper to itſelf for expreſſing the Inſtrument of Action; it does not however reject the uſe of the Arabick Inſtrumental Noun which is repreſented by the forms مِنْصَر مِنْصَار or مِنْصَرَت.

Ex. 1. governing another ſub. fol. بميزان عقل سنجيد he weighed in ſcale of reaſon.

مفتاح مقصود the key of his intention.

IV. All Arabick proper names, and the names of things, are introduced into the Perſian at pleaſure.

Ex. مريم Mary, مكّه Mecca, عين the eye, لحم fleſh, جدّ an anceſtor, &c. &c.

OF ARABICK ADJECTIVES.

I. Beſides the Arabick Participles which we have already obſerved are uſed as Adjectives, there is alſo a plentiful ſource of real Adjectives formed by affixing ي to Subſtantives of almoſt every denomination, which are freely introduced into the Perſian.

Ex. انساني humane, اراضي earthly, مصري Egyptian, &c. &c.

II. The Maſculine Singulars of Arabick Superlatives are uſed in the Perſian both as Subſtantives and Adjectives.

Ex. 1. as a ſub. governing another fol. it, اسعد زمان the moſt fortunate of times.

2. as an ad. qualifying a ſub. going before, در وقتِ احسن at a moſt lucky time.

III.

III. The Mafculine Plurals of Arabick Superlatives are ufed in the Perfian both as Subftantives and Adjectives.

Ex. 1. as a fub. governing another fol. it, اکابرِ وقت the great men of the age.

2. as an ad. qualifying a fub. going before, اشخاصِ اکابر moft illuftrious perfonages.

IV. The Feminine Singulars of Arabick Superlatives are ufed in the Perfian as Adjectives.

Ex. 1. qualifying a fub. going before, دولتِ عظمي profperity moft great.

V. Arabick Ordinal Numbers are ufed in the Perfian as Adjectives.

Ex. 1. qualifying a fub. going before, بابِ اول the firft chapter.

OF THE FORM OF ARABICK WORDS WHEN USED IN THE PERSIAN.

I. All Arabick Infinitives, Participles, Subftantives, and Adjectives, are introduced into the Perfian in the form of the nominative, which throws away from the laft letter every fpecies of Nunnation (ٌ ٍ ً) or fhort vowel (ُ ِ َ), which they may poffefs as Arabick words, and remain without motion: but, when their conftruction in the Perfian requires them to affume the termination of another cafe, they receive it in the fame manner as if they were originally Perfian words; with the following exceptions.

1ft. When an Arabick word terminating in ي, that muft be pronounced as ا *, becomes the firft Subftantive in conftruction with another Subftantive following it, ي is actually changed into ا, to which fhort ي (ِ) is afterwards affixed, to fhew the conftruction.

Ex. تمني in conftruction becomes تمناي as تمناي شفاعت the petition of interceffion, and fo alfo مولي دعوي معني &c.

2d. Feminine Arabick *Subftantives* terminating in ة, when introduced into the Perfian, change ة, fometimes into ه, and fometimes into ت

* See Richardfon's Arabick Gram. p. 109. Canon III.

Ex.

Ex. محبه friendſhip, being found written by the ſame author محبه and محبت

3d. Feminine Arabick *Adjectives* and *Participles* terminating in ةٌ, when introduced into the Perſian, always change ةٌ into ه.

Ex. خالصة pure, is always written خالصه as محبت خالصه pure friendſhip.

4th. Arabick Participles Plural, terminating in ين, although introduced into the Perſian as Nominatives, are originally the oblique caſe.

Ex. دانایان متقدمین چنین فرمودند the learned ancients thus ſaid.

5th. When an Arabick Infinitive is uſed in the Perſian language as an adverb, it is introduced in the form of the Arabick accuſative without any change.

Ex. اتفاقا accidentally, &c. &c.

OF ARABICK ADVERBS, PREPOSITIONS AND CONJUNCTIONS.

I. Arabick Adverbs, Prepoſitions, and Conjunctions ſeem to be introduced into the Perſian language at pleaſure. Of theſe Mr. Richardſon has made a very uſeful collection in his Chapter of ſeparate Particles, to which I beg leave to refer; obſerving at the ſame time, that a knowledge of ſuch, as are moſt frequently employed, will eaſily be acquired from experience without any particular inſtructions.

OF ARABICK COMPOUNDS.

I. The manner, in which different Arabick parts of ſpeech are employed to form a variety of Compounded Words made uſe of in the Perſian, is well explained by Sir William Jones in his Perſian Grammar; and with reſpect to Phraſes purely Arabick, and whole ſentences, which are often met with in Perſian Authors, they require a perfect knowledge of the Arabick language, and do not belong to this place.

OF THE CONSTRUCTION OF ARABICK INFINITIVES, PARTICIPLES, SUBSTANTIVES AND ADJECTIVES.

I. In the Perſian language, when Arabick Adjectives or Participles are made uſe of to qualify Arabick or Perſian Subſtantives Singular, they agree with them in Gender and Number.

Ex. 1. an Arabick ſub. maſc. qualified by an Arabick part. paſ. maſc. عاشق مذكور the ſaid lover.

2. an Arabick ſub. fem. qualified by an Arabick part. paſ. fem. والدهٔ مكرمه reſpected mother.

3. a Perſ. ſub. maſc. qualified by an Arabick ad. maſc. دوست قديم an old friend.

4. a Perſ. ſub. fem. qualified by an Arabick ad. fem. همشيرهٔ عزيزه dear ſiſter.

II. When Arabick Adjectives and Participles are made uſe of to qualify Arabick and Perſian Subſtantives Maſculine and Plural, they remain in the Maſculine Singular.

Ex. 1. an Arab. ſub. maſc. plur. with an Arab. part. maſc. Sing. حكام مذكور the ſaid officers.

2. a Perſ. ſub. maſc. plur. with an Arab. part. maſc. Sing. برادران مذكور the ſaid brethren.

III. When Arabick Adjectives and Participles are made uſe of to qualify Arabick or Perſian Subſtantives Feminine and Plural, they are put in the Feminine Singular; and often, though not ſo properly, in the Maſculine Singular.

Ex. 1. an Arabick ſub. fem. plur. with Arabick part. Sing. both fem. maſ. تكليفات مذكوره مذكور the ſaid burthens.

2. a Perſian ſub. fem. plur. with Arabick part. Sing. both fem. and maſ. زنان موصوفه موصوف accompliſhed women.

IV. An Arabick Subſtantive, in the Perſian, is often rendered definite by a following Arabick Adjective or Participle having the article ال prefixed.

Ex. a ſub. with a part. paſ. نبي المختار the prophet elect.

For

For an account of the Genders of Arabick Words, and of their perfect and imperfect Plurals, I muſt again refer to Mr. Richardſon's Arabick Grammar; and to that of ERPENIUS, where the latter ſubject is treated at ſtill greater length.

OF THE INTRODUCTION OF THE ARABICK INTO THE LANGUAGE OF HINDOSTAN.

I. All the different ſpecies of Infinitives, Participles, Subſtantives and Adjectives which we have enumerated; and all compounds formed by *Arabick* and *Perſian* words, are introduced into the language of *Hindoſtan*, in the ſame form, for the ſame purpoſes, and with the ſame freedom as in the *Perſian:* ſubmitting themſelves to the different rules of regimen and concord, that are peculiar to *that* language; in the ſame manner as if they were words originally belonging to it. *Arabick* Adverbs, Prepoſitions, and Conjunctions are alſo uſed in the language of *Hindoſtan*; but I think leſs frequently than in the *Perſian.*

XV.

XV.

ON THE ASTRONOMICAL COMPUTATIONS OF THE HINDUS.

By Samuel Davis, *Esq.*

Bhágalpur, 15*th Feb.* 1789.

IT is, I believe, generally admitted, that inquiries into the aſtronomy of the *Hindus* may lead to much curious information, beſides what relates merely to the ſcience itſelf; and that attempts to aſcertain the chronology of this ancient nation will, as they have hitherto done, prove unſatisfactory, unleſs aſſiſtance be derived from ſuch reſearches.

The following communication is not expected to contribute towards ſo deſirable a purpoſe; but, with all its imperfections, it may have the uſeful effect of awakening the attention of others in this country, who are better qualified for ſuch inveſtigations, and of inciting them to purſue the ſame object more ſucceſsfully, by ſhowing that numerous treatiſes in *Sanſcrit* on aſtronomy are procurable, and that the *Bráhmens* are extremely willing to explain them. As an encouragement to thoſe, who may be inclined to amuſe themſelves in this way, I can farther venture to declare, from the experience I have had, that *Sanſcrit* books in this ſcience are more eaſily tranſlated than almoſt any others, when once the technical terms are underſtood: the ſubject of them admitting neither of metaphyſical reaſoning nor of metaphor, but being delivered in plain terms and generally illuſtrated with examples in practice, the meaning may be well enough made out, by the help of a *Pandit*, through the medium of the *Perſian* or the *Hindì* language.

Moreover it does not appear, that ſkill in the abſtruſe parts of modern mathematicks is indiſpenſably neceſſary, but that, with as much knowledge of geometry and the circles of the ſphere, as it may be ſuppoſed moſt of the members of this ſociety poſſeſs, a conſiderable progreſs might be made in revealing many intereſting particulars, which at preſent lie hid to *Europeans* in the *Jyótiſh*, or aſtronomical, *Sáſtra*.

The prediction of eclipſes and other phenomena, publiſhed in the *Hindu Patra*, or almanack, excited my curioſity long ago, to know by what means it was effected; but it was not until lately that I had any means of gratification: I had before this been inclined to think with many others, that the *Bráhmens* poſſeſs no more knowledge

ledge in aſtronomy than they have derived from their anceſtors in tables ready calculated to their hands, and that few traces of the principles of the ſcience could be found among them; but, by conſulting ſome *Sanſcrit* books, I was induced to alter my opinion. To ſatisfy myſelf on this ſubject, I began with calculating, by a modern *Hindu* formula, an eclipſe which will happen in next *November*; the particulars of which proceſs, although in ſome meaſure intereſting, were not ſufficient for my purpoſe, as it yet remained to be learnt, on what grounds ſome tables uſed in it were conſtructed; and for this information I was referred to the *Súrya Siddhánta*, an original treatiſe and reputed a divine revelation. For a copy of the *Súrya Siddhánta*, I am indebted to Sir ROBERT CHAMBERS, who procured it among other books at *Benares*; but the obſcurity of many technical terms made it ſome times difficult to be underſtood even by the *Pandit* I employed, who was by no means deeply verſed in the ſcience he profeſſed. By his diligence and through the obliging aſſiſtance of Mr. DUNCAN at *Benares*, who procured for me the *Ticà* or Commentary, this difficulty was at length ſurmounted; and a computation of the above-mentioned eclipſe, not merely on the principles, but ſtrictly by the rules, of the *Súrya Siddhánta*, is what I propoſe now to preſent you with, after ſuch preliminary obſervations as may be neceſſary to make it intelligible.

I ſuppoſe it ſufficiently well known, that the *Hindu* diviſion of the ecliptick into ſigns, degrees, &c. is the ſame as ours; that their aſtronomical year is ſydereal, or containing that ſpace of time in which the ſun, departing from a ſtar, returns to the the ſame; that it commences on the inſtant of his entering the ſign *Aries*, or rather the *Hindu* conſtellation *Méſha* *: that each aſtronomical month contains as many even days and fractional parts, as he ſtays in each ſign; and that the civil differs from the aſtronomical account of time only in rejecting thoſe fractions, and beginning the year and month at ſunriſe, inſtead of the intermediate inſtant of the artificial day or night.

Hence ariſes the unequal portion of time aſſigned to each month dependant on the ſituation of the ſun's apſis, and the diſtance of the vernal equinoctial colure from the beginning of *Méſha* in the *Hindu* ſphere; and by theſe means they avoid thoſe errors, which *Europeans*, from a different method of adjuſting their calendar by intercalary days, have been ſubject to. An explanation of theſe matters would lead me beyond my preſent intention, which is to give a general account only of the method

* Or, to be more particular, on his entering the *Nacſhatra*, or lunar manſion (*Aſwini*). There were formerly only twenty-ſeven *Nacſhatras*; a 28th (*Abbijit*) has been ſince added, taken out of the 21ſt and 22d, named *Uttaráſhára* and *Sravanà*. Theſe three in their order comprehend 10°, 5°, and 11° 40′ of the Zodiack: the reſt comprehend 13° 20′ each.

by

by which the *Hindus* compute eclipſes, and thereby to ſhow, that a late *French* author was too haſty, in aſſerting generally that they determine them "by ſet forms, couched in enigmatical verſes, &c.*" So far are they from deſerving the reproach of ignorance, which Monſ. SONNERAT has implied, that on enquiry, I believe, the *Hindu* ſcience of aſtronomy will be found as well known now, as it ever was among them, although, perhaps, not ſo generally, by reaſon of the little encouragement men of ſcience at preſent meet with, compared with what they formerly did under their native princes.

It has been common with aſtronomers to fix on ſome epoch, from which, as from a radix, to compute the planetary motions; and the ancient *Hindus* choſe that point of time counted back, when, according to their motions as they had determined them, they muſt have been in conjunction in the beginning of *Méſha* or *Aries*, and coeval with which circumſtance they ſuppoſed the creation. This, as it concerned the planets only, would have produced a moderate term of years compared with the enormous antiquity, that will be hereafter ſtated; but, having diſcovered a ſlow motion of the nodes and apſides alſo, and taken it into the computation, they found it would require a length of time correſponding with 1955884890 years now expired, when they were ſo ſituated, and 2364115110 years more, before they would return to the ſame ſituation again, forming together the grand anomaliſtick period denominated a *Calpa*, and fancifully aſſigned as the day of BRAHMA'. The *Calpa* they divided into *Manwanteras*, and greater and leſs *Yugas*. The uſe of the *Manwantera* is not ſtated in the *Súrya Siddhánta*, but that of the *Mahà*, or greater *Yug*, is ſufficiently evident, as being an anomaliſtick period of the ſun and moon, at the end of which the latter, with her apogee and aſcending node, is found, together with the ſun, in the firſt of *Aries*; the planets alſo deviating from that point, only as much as is their latitude and the difference between their mean and true anomaly.

Theſe Cycles being ſo conſtructed, as to contain a certain number of mean ſolar days, and the *Hindu* ſyſtem aſſuming, that at the creation, when the planets began their motions, a right line, drawn from the equinoctial point *Lancà* through the centre of the earth, would, if continued, have paſſed through the centres of the ſun and planets to the firſt ſtar in *Aries*, their mean longitude for any propoſed time afterwards may be computed by proportion. As the revolutions a planet makes in any cycle are to the number of days compoſing it, ſo are the days given to its motion in that time; and, the even revolutions being rejected, the fraction, if any, ſhows its

* See the tranſlation of Monſ. SONNERAT's Voyage.

mean

mean longitude at midnight under their firſt meridian of *Lancà:* for places eaſt or weſt of that meridian a proportional allowance is made for the difference of longitude on the earth's ſurface, called in *Sanſcrit* the *Déſántara.* The poſitions of the apſides and nodes are computed in the ſame manner, and the equation of the mean to the true place determined on principles, which will be hereafter mentioned.

The diviſion of the *Mahá Yug* into the *Satya*, *Tréta*, *Dwápar*, and *Cali*, ages, does not appear from the *Súrya Siddhánta* to anſwer any practical aſtronomical purpoſe, but to have been formed on ideas ſimilar to the *golden*, *ſilver*, *brazen*, and *iron* ages of the *Greeks*. Their origin has however been aſcribed to the preceſſion of the equinoxes by thoſe, who will of courſe refer the *Manwantera* and *Calpa* to the ſame foundation: either way the latter will be found anomaliſtick, as has been deſcribed, if I rightly underſtand the following paſſage in the firſt ſection of the *Súrya Siddhánta*, the tranſlation of which is, I believe, here correctly given.

——" Time, of the denomination *Murta* *, is eſtimated by reſpirations; ſix reſpirations make a *Vicalà*, ſixty *Vicalàs* a *Danda*, ſixty *Dandas* a *Nacſhatra* day, and thirty *Nacſhatra* days a *Nacſhatra* month. The *Sávan* month is that contained between thirty ſucceſſive riſings of *Súrya*, and varies in its length according to the *Lagna Bhuja*. Thirty *Tit'hi's* compoſe the *Chándra* month. The *Saura* month is that, in which the ſun deſcribes one ſign of the zodiack, and his paſſage through the twelve ſigns is one year, and one of thoſe years is a *Déva* day, or day of the Gods. When it is day at *Aſura* †, it is night with the GODS, and when it is day with the GODS it is night at *Aſura*. Sixty of the *Déva* days multiplied by ſix give the *Déva* year, and twelve hundred of the *Déva* years form the aggregate of the four *Yugas*. To determine the *Saura* years contained in this aggregate, write down the following numbers, 4, 3, 2, which multiply by 10,000; the product 4320000 is the aggregate or *Mahà Yuga*, including the *Sandhi* and *Sandhyanſa* ‡. This is divided into four *Yugas*, by reaſon of the different proportions of *Virtue* prevailing on earth, in the following manner. Divide the aggregate 4320000 by 10,

* This is mean ſydereal time:—A *Nacſhatra*, or ſyderal day, is the time in which the earth makes a turn upon its axis, or, according to the *Hindus*, in which the ſtars make one complete revolution. This is ſhorter than the *Sávan* or ſolar day, which varies in its length according to the *Lagna Bhuja*, or right aſcenſion, and alſo from the ſun's unequal motion in the eclipticк; for both which circumſtances the *Hindus* have their *equation of time*, as will appear in the calculation of the eclipſe.

† *Aſura*, the South Pole, the habitation of the *Aſura Lóca*, or Demons, with whom the *Devas*, who reſide at *Suméru*, the North Pole, wage eternal war.

‡ *Sandhi* and *Sandhyanſa*, the morning and evening twilight. " The proper words, I believe, are *Sandhyà* and " *Sandhyánſa*."

" two

" and multiply the quotient by four for the *Satya Yug*, by three for the *Tréta*, by " two for the *Dwápar*, and by one for the *Cali Yug*. Divide either of the *Yugs* " by six for its *Sandhi* and *Sandhyansa*. Seventy-one *Yugs* make a *Manwantera*; " and at the close of each *Manwantera* there is a *Sandhi* equal to the *Satya Yug*, " during which there is an universal deluge. Fourteen *Manwanteras*, including " the *Sandhi*, compose a *Calpa*, and at the commencement of each *Calpa* there is a " *Sandhi* equal to the *Satya Yug*, or 1728000 *Saura* years. A *Calpa* is therefore " equal to 1000 *Mahá Yugs*. One *Calpa* is a day with BRAHMA', and his night " is of the same length; and the period of his life is 100 of his years. One half " of the term of BRAHMA''s life, or fifty years, is expired, and of the remainder " the first *Calpa* is begun; and six *Manwantera's*, including the *Sandhi*, are ex- " pired. The seventh *Manwantera*, into which we are now advanced, is named " *Vaivaswata*: of this *Manwantera* twenty-seven *Mahá Yugs* are elapsed, and we " are now in the *Satya Yug* of the twenty-eighth, which *Satya Yug* consists of " 1728000 *Saura* years. The whole amount of years, expired from the beginning " of the *Calpa* * to the present time, may hence be computed; but from the num- " ber of years so found must be made a deduction of one hundred times four " hundred and seventy-four divine years, or of that product multiplied by three

* Construction of the *Calpa*.

		Years.
Cali, - - - -	$\frac{4320000}{10} =$	432000
Dwápar, - - -	$\frac{4320000}{10} \times 2 =$	864000
Tréta, - - -	$\frac{4320000}{10} \times 3 =$	1296000
Satya, - - -	$\frac{4320000}{10} \times 4 =$	1728000
Aggregate or *Mahá Yug*, - - -		4320000
		71
Manwantera, - - - - -		306720000
With a *Sandhi* equal to the *Satya Yug* -		1728000
		308448000
		14
Calpa, - - - - - -		4318272000
With a *Sandhi* equal to the *Satya Yug*,		1728000
Whole duration of a *Calpa*, - -		4320000000

Computation of the period elapsed of the *Calpa* at the end of the last *Satya* age, when the *Súrya Siddhánta* is supposed to have been written.

		Years.
Sandhi at the beginning of the *Calpa*,	-	1728000
6 *Manwanteras* or	$308448000 \times 6 =$	1850688000
27 *Mahá Yugs* of the 7th *Manwantera* or	$4320000 \times 27 =$	116640000
Satya Age of the 28th *Mahá Yug*,	=	1728000
		1970784000

hundred

" hundred and ſixty for human years, that being the term of BRAHMA's employ-
" ment in the creation ; after which the planetary motions commenced.

" Sixty *Vicalas* make one *Calá*, ſixty *Calás* one *Bhága*, thirty *Bhágas* one *Ráſi*, " and there are twelve *Ráſis* in the *Bhagana* *.

" † In one *Yug*, *Súrya*, *Budha*, and *Sucra* perform 4320000 *Madhyama* revolu- " tions through the Zodiack. *Mangala*, *Vrihaſpati*, and *Sani* make the ſame num- " ber of *Síghra* revolutions through it; *Chandra* makes 57753336 ‡ *Madhyama* " revolutions; *Mangala* 2296832 *Madhyama* revolutions; *Budha's Síghras* are " 17937060; *Vrihaſpati's Madhyamas* 364220; *Sucra's Síghras* 7022376; *Sani's* " *Madhyamas* are 146568. The *Chandróchcha* revolutions are 488203; the retro- " grade revolutions of the *Chandrapáta* are 232238.

" The time contained between ſunriſe and ſunriſe is the *Bhúmi Sávan* day: the " number of thoſe days contained in a *Yug* is 1577917828 §. The number of " *Nacſhatra* days 1582237828 ‖; of *Chándra* days 1603000080; of *A'dhi* months

* The diviſion of the *Bhagana*, or Zodiack, into Signs, Degrees, &c.

† *Súrya* the Sun; *Budha*, Mercury; *Sucra*, Venus; *Mangala*, Mars; *Vrihaſpati*, Jupiter; *Sani*, Saturn; *Chandra* the Moon; the *Chandra Uchcha*, or *Chandróchcha*, the Moon's Apogee; *Chandra Páta*, the Moon's aſcending Node. The *Madhyama* revolutions of Mars, Jupiter and Saturn, and the *Síghra* revolutions of Venus and Mercury, anſwer to their revolutions about the ſun.

‡ 57753336—4320000=53433336 lunar months, or lunations in a *Yug*; and $\frac{1577917828}{53433336}$ = 29 D. 31 D. 50 P., 6 &c. in each mean lunation, or in Engliſh time 29 D. 12 H. 44 M. 2 S. 47'''. 36''''. 53433336—51840000 = 1593336 *Adhi* or intercalary lunar months in 4320000 ſolar ſydereal years.

§ $\frac{1577917828}{4320000}$ = 366. 15. 31. 31. 24. diurnal revolutions of the Sun, the length of the *Hindu* year.

‖ $\frac{1582237828}{4320000}$ = 366. 15. 31. 31. 24. diurnal revolutions of the ſtars in one year. $\frac{1577917828}{57753336}$ = 27. 19. 18. 1. 37. &c. The Moon's periodical month. The 1603000080 *Chándra*, or lunar, days, called alſo *Tit'his*, are each one thirtieth part of the moon's ſynodical month or relative period, and vary in length according to the inequality of her motion from the ſun: the *Cſhaya Tit'his* and *Adhi*, or intercalary, lunar months are ſufficiently evident.

The ſun and planets preſide alternately over the days of the week, which are named accordingly. The firſt day after the creation was *Ravivàr* or *Sunday*: it began at midnight under the meridian of *Lancà*, and the *Ravivàr* of the *Hindus* correſponds with our Sunday. The ſun and planets in the ſame manner govern the years: hence they may be ſaid to have *weeks* of years. DANIEL's propheſy is ſuppoſed to mean *weeks* of years.

The *Hindu* Cycle of 60, ſuppoſed by ſome to be the Chaldean *Soſos*, is referred to the planet Jupiter: " one of " theſe years is equal to the time in which by his mean motion, he (*Vrihaſpati*) advances one degree in his orbit." (Commentary on the *Súrya Siddhánta*). This Cycle is, I believe, wholly applied to aſtrology. Neither this Cycle of 60 nor the *Pitri's* day are mentioned in this part of the *Súrya Siddhánta*, where they might be expected to occur: perhaps on inquiry there may be found ſome reaſon for ſuppoſing them both of a later invention. " The *Pitris* in- " habit behind *Chándra*, and their mid-day happens when *Chándra* is in conjunction with *Súrya*, and their midnight, " when *Chándra* is in oppoſition to *Súrya*; their morning, or ſunriſe, is at the end of half the *Cri[illegible]na Pacſha*, and their " ſunſet at the end of half the *Sucla Pacſha*: this is declared in the *Sácalya Sanhità*. Their names are *Agni*, *Swáti*, " &c their day and night are therefore together equal to one *Chándra* month." (Commentary.) Hence it appears, the *Hindus* have obſerved that the moon revolves once on her axis in a lunar month, and conſequently has the ſame ſide always oppoſed to the earth. They have alſo noticed the difference of her apparent magnitude in the horizon and on the meridian, and endeavour to explain the cauſe of a phenomenon, which *Europeans* as well as themſelves are at a loſs to account for.

N N 1593336;

" 1593336; of *Cshaya Tit'his* 25082252; of *Saura* months 51840000. From " either of the planets' *Nacshatra* days deduct the number of its revolutions, the " remainder will be the number of its *Sávan* days contained in a *Yug*. The difference between the number of the revolutions of *Súrya* and *Chándra* gives the " number of *Chándra* months; and the difference between the *Saura* months and " *Chándra* months gives the number of *A'dhi* months. Deduct the *Sávan* days " from the *Chándra* days, the remainder will be the number of *Tit'hi Cshayas*. The " number of *A'dhi* months, *Tit'hi Cshayas*, *Nacshatra*, *Chándra*, and *Sávan* days, " multiplied severally by 1000, gives the number of each contained in a *Calpa*.

" The number of *Mandóchcha* revolutions, which revolutions are direct, or according to the order of the signs contained in a *Calpa*, is of *Súrya* 387; of *Mangala* 204; of *Budha* 368; of *Vrihaspati* 900; of *Sucra* 535; of *Sani* 39.

" The number of revolutions of the *Páta's*, which revolutions are retrograde, or " contrary to the order of the signs contained in a *Calpa*, is of *Mangala* 214; of " *Budha* 488; of *Vrihaspati* 174; of *Sucra* 903; of *Sani* 662. The *Páta* and " *Uchcha* of *Chándra* are already mentioned."

It must be observed, that although the planetary motions as above determined might have served for computations in the time of MEYA, the author of the *Súrya Siddhánta*, yet for many years past they have not been found to agree with the observed places in the heavens in every instance, and that corrections have accordingly been introduced by increasing or reducing those numbers. Thus the motions of the moon's apogee and node are now increased in computations of their places by the addition of four revolutions each in a *Yug* to their respective numbers above given. The nature of these corrections, denominated, in *Sanscrit*, *Bíja*, is explained in a passage of the *Tícà*, or Commentary, on the *Súrya Siddhánta*, wherein is maintained the priority of that *Sástra* in point of time to all others. The translation of that passage together with the text it illustrates is as follows:

(Súrya Siddhánta.) " ARCA (the Sun) addressing MEYA, who attended with " reverence, said: Let your attention, abstracted from human concerns, be wholly " applied to what I shall relate. SU'RYA in every former *Yug* revealed to the " *Munis* the invariable science of astronomy. The planetary motions may alter; " but the principles of that science are always the same."

(The Commentary.) " Hence it appears, that the *Súrya Siddhánta* was prior to " the *Brahma Siddhánta* and every other *Sástra*; because this *Sástra* must be the " same that was revealed *in every former Yug*, although the motions of the planets

" might

"might have been different. This variation in the planetary motions is mentioned in "the *Viſhnu Dhermótter*, which directs that the planets be obſerved with an inſtru-"ment, whereby their agreement or diſagreement may be determined in regard to "their computed places, and in caſe of the latter an allowance of *Bíja* accordingly "made. VASISHT'HA in his *Siddhánta* alſo recommends this occaſional correction "of *Bíja*, ſaying to the *Muni* MA'NDAVYA: "I have ſhown you how to determine "ſome matters in aſtronomy; but the mean motion of *Súrya* and the other planets "will be found to differ in each *Yug*." "Accordingly A'RYABHATTA, BRAHMA-"GUPTA, and others, having obſerved the heavens, formed rules on the principles "of former *Sáſtras*, but which differed from each other in proportion to the diſ-"agreements, which they ſeverally obſerved, of the planets with reſpect to their "computed places.

"Why the *Munis*, who certainly knew, did not give the particulars of thoſe de-"viations, may ſeem unaccountable, when the men A'RYABHATTA, BRAHMA-"GUPTA, and others, have determined them: the reaſon was, that thoſe deviations "are not in themſelves uniform; and to ſtate their variations would have been "endleſs. It was therefore thought better, that examinations at different times "ſhould be made, and due corrections of the *Bíja* introduced. A *Ganita Sáſtra*, "whoſe rules are demonſtrable, is true; and when conjunctions, oppoſitions, and "other planetary phenomena, calculated by ſuch *Sáſtras*, are found not to agree "with obſervation, a proportionable *Bíja* may be introduced without any deroga-"tion from their credit. It was therefore neceſſary, that this *Sáſtra* (the *Súrya* "*Siddhánta*) ſhould be revealed in each *Yug*, and that other *Sáſtras* ſhould be com-"poſed by the *Munis*.

"The original *Sáſtra* then appears to be the *Súrya Siddhánta*; the ſecond, the "*Brahma Siddhánta*; the third, the *Paulaſtya Siddhánta*; the fourth, the *Sóma* "*Siddhánta*."

In the following table are given the periodical revolutions of the planets, their nodes and apſides, according to the *Súrya Siddhánta*. The corrections of *Bíja* at preſent uſed are contained in one column *, and the inclination of their orbits to the ecliptick in another. The obliquity of the ecliptick is inſerted according to the

* This I muſt however at preſent omit, not having as yet diſcovered the corrections of this kind, that will bring even the Sun's place, computed by the *Súrya Siddhánta*, exactly to an agreement with the aſtronomical books in preſent uſe. Of theſe books, the principal are, the *Grahalághava* compoſed about 268 years ago, the tables of *Macaranda* uſed at *Benares* and *Tirhút*, and the *Siddhánta Rahaſya* uſed at *Nádíyà*; the laſt written in 1513 *Sáca* or 198 years ago.

ſame

fame *Sáſtra*. Its diminution does not appear to have been noticed in any ſubſequent treatiſe: in the tables of *Macaranda* and alſo in the *Grahalághava*, the latter written only 268 years ago, it is expreſsly ſtated at twenty-four degrees.

The Planets in their order.	*Sydereal Period.*	*Period of the Apſides.*	*Period of the Nodes.*	*Mean motion per day ′ ″ per danda″ ‴*	*Inclination of the Orbit.*	Cacſha, *or circumference of the Orbit.*
	Days. D. P. V.	Days. D.	Days. D.	″ ‴		*Yojan.*
The Moon,	27 19 18 1 &c.	3232 50 —	6794 23	790 35	4 30	324000
Mercury,	87 58 10 ——	4287820184 46 —	3233742458 11	186 24	2 —	1043208
Venus,	281 39 38 ——	2949379117 45 &c.	1747417306 45	37	2 —	26646637
The Sun,	265 15 13 31 24	4077307049 5 —	Preceſſion of the equinoxes 54″ per year.	59 8	Obliquity of the Ecliptick 24°	4331500
Mars,	686 59 50 38	7735087392 9 &c.	7373447794 23 &c.	31 26	1 30	8146909
Jupiter,	4332 19 14 20 &c.	1753242031 6 &c	9068493264 22 &c.	5 —	1 —	51375764
Saturn,	10765 46 2 18 &c	42767123794 52 &c.	2383561673 42 &c.	2 —	2 —	127668255

The longitude of the ſun's apogee in the *Hindu* ſphere is 2^s, 17°, 17′, 15″, to which add the *Ayananſa* 19°, 21′, 27″, the ſum 3^s, 6°, 38′, 42″, is its place according to *European* expreſſion. In this the Hindu account differs about 1° 22′ from the obſervations of *European* aſtronomers, who determine the place of the earth's aphelion in the preſent age to be in 9^s, 8°, 1′. There is much greater diſagreement with reſpect to the aphelia and nodes of the other planets.

On ſuppoſition that the obliquity of the ecliptick was accurately obſerved by the ancient *Hindus*, as 24°, and that its decreaſe has been from that time half a ſecond a year, the date of the *Súrya Siddhánta* will be about 3840 years. It is remarkable that the *Hindus* do not appear to have noticed its decreaſe.

The *Cacſhas* are explained farther on.

The motion of the equinoxes, termed in *Sanſcrit* the *cránti*, and ſpoken of in the *Tícà*, or commentary, on the *Súrya Siddhánta* as the ſun's *Páta* or Node, is not noticed in the foregoing paſſage of that book; and, as the *Hindu* aſtronomers ſeem to entertain an idea of the ſubject different from that of its revolution through the *Platonick* year, I ſhall farther give a tranſlation of what is mentioned, both in the original and commentary, concerning it.

The next requiſite for the computation of the eclipſe is the portion of the *Calpa* expired to the preſent time, which is determined in the following manner.

The *Súrya Siddhánta* is ſuppoſed to have been received through divine revelation, towards the cloſe of the *Satya* age, at the end of which, 50 of the years of *Brahmá* were expired, and of the next *Calpa*, or day, 6 *Manwanteras*, 27

greater

greater *Yugs*, and the *Satya* age of the 28th *Yug*, together with the *Sandhya* or twilight at the beginning of the *Calpa*; the aggregate of which ſeveral periods is 1970784000 years elapſed of the *Calpa* to the beginning of the laſt *Treta* age; to which add the *Treta* and *Dwapar* ages, together with the years elapſed of the preſent *Cali* age, for the whole amount of ſydereal years from the beginning of the *Calpa* to the preſent *Bengal* year. But in the foregoing quotation it is obſerved, from that amount of years muſt be made a deduction of 47400 divine, or 17064000 human or ſydereal years, the term of *Brahmá's* employment in the work of creation; for, as the univerſe was not completed, the planetary motions did not commence until that portion of the *Calpa* was elapſed.

This deduction appears to have been intended as a correction, which, without altering the date of the *Calpa*, as ſettled, probably, by yet more ancient aſtronomers, might (joined perhaps with other regulations) bring the computed places of the planets to an agreement with their obſerved places, when the *Súrya Siddhánta* was written; and, as the arguments of its commentator in ſupport of the propriety of it, without prejudice to other authors, contain ſome curious particulars, I hope I may be excuſed for departing from my immediate object to inſert a tranſlation of them.

" In the *Súrya Siddhánta*, *Sóma Siddhánta*, *Prajápeti*, *Vaſiſht'ha*, and other *Sáſtras*, " this deduction is required to be made from the *Calpa*, becauſe at the end of that " term, the planetary motions commenced. The ſon of Jishnu, who underſtood " four *Védas*, and Bha'scara'cha'rya, conſidered theſe motions as commencing " with the *Calpa*: it may ſeem ſtrange that there ſhould be ſuch a diſagreement. " Some men ſay: as it is written that the *Calpa* is the day of Brahma', and as a " day is dependent on the riſing and ſetting of the ſun, the motion of the ſun and " planets muſt have begun with the *Calpa*; and therefore Brahmagupta ſhould " be followed; but I think otherwiſe. The *Calpa* or Brahma''s day is not to be " underſtood as analogous to the ſolar day, otherwiſe than as containing a determined " portion of time; neither is it at all dependent on the commencement of the *Calpa*; " but, being compoſed of the ſame periods as the latter, it will not end until the term " of years here deducted ſhall be expired of the next *Calpa*. The motions of the " *Grahas* muſt therefore be computed from the point of time here ſtated as the beginning of Brahma''s day, and not, as Brahmagupta and others direct, from " the beginning of the *Calpa*, which will not be found to anſwer.

" Other men ſay, that rules derived from the *Ganita Sáſtra* and agreeing with ob" ſervation, are right; that any period deduced from ſuch a mode of computation,

" and

" and the planets determined to have been then in the firſt of *Méſha*, may be aſ-
" ſumed; that it will therefore anſwer either way, to conſider theſe motions as be-
" ginning with the *Calpa*, or after the above-mentioned period of it was expired.
" This, however, is not true; for in the inſtance of *Mangala* there will be found a
" great difference, as is here ſhown. The revolutions of *Mangala* in a *Calpa* accord-
" ing to BRAHMAGUPTA are 2296828522, and, by the rule of proportion, the revo-
" lutions of *Mangala* in 17064000 years are 9072472, 7 Signs 28° 0′ 16″*. For any other
" planet, on trial, a ſimilar diſagreement will be found, and the propoſition of com-
" puting from either period muſt be erroneous. Moreover, of what uſe is it to make
" computations for a ſpace of time, when the planets and their motions were not in
" being?

" It might however from the foregoing circumſtances, be imputed to BRAHMAGUP-
" TA and the reſt, that they have given precepts through ignorance, or with intent to
" deceive—That, having ſtated the revolutions of the planets different from the account
" revealed by SU'RYA, they muſt certainly have been in error—That BRAHMAGUP-
" TA could not have counted the revolutions from the beginning of the *Calpa*; nei-
" ther could he from the mean motion of the planets have ſo determined them.—He
" was a mortal, and therefore could not count the revolutions.—Although the rule of
" proportion ſhould be granted to have ſerved his purpoſe for the revolutions of the
" planets, yet it certainly could not for thoſe of their *Mandóchcha*, becauſe it was not
" within the term of a man's life to determine the mean motion of the *Mandóchcha*;
" and this aſſertion is juſtified by the opinion of BHA'SCARA'CHA'RYA. But the rule
" of proportion could not have anſwered even for the planets; for, although their
" mean motion be obſerved one day, and again the next, how can a man be certain
" of the exact time elapſed between the two obſervations? And if there be the ſmall-
" eſt error in the elapſed time, the rule of proportion cannot anſwer for ſuch great
" periods. An error of the $\frac{1}{10000000}$ part of a ſecond (*Vicalà*) in one day amounts
" to forty degrees † in the computation of a *Calpa*, and the miſtake of $\frac{1}{10}$ of a re-
" ſpiration in one *Saura* year makes a difference in the ſame period of 20000 days.
" That it is therefore evident, BRAHMAGUPTA's motive, for directing the plane-
" tary motions to be computed as commencing with the *Calpa*, was to deceive man-
" kind, and that he had not the authority of the *Munis*, becauſe he differs from the

* Becauſe $\frac{2296828522 \times 17064000}{4320000000}$ = Revolutions 9072472, S. 7 28° 0′ 16″.

† The error would be more than 43°.

Súrya

" *Súrya Siddhánta*, *Bráhma Siddhánta*, *Sóma Siddhánta*; from VASISHT'HA and
" other *Munis*.

" Such opinions would have no foundation, as I ſhall proceed to ſhow. BRAH-
" MAGUPTA's rules are conſiſtent with the practice of the *Pandits* his predeceſ-
" ſors; and he formed them from the *Purana Viſhnu Dhermóttara*, wherein is
" contained the *Brahma Siddhánta*; and the periods given by A'RYABHATTA are
" derived from the *Paráſera Siddhánta*: the precepts of the *Munis* are therefore
" the authorities of BRAHMAGUPTA, A'RYABHATTA, and BHA'SCARA'CHA'RYA,
" whoſe rules cannot be deceitful. The *Munis* themſelves differed with regard to
" the number of *Sávan* days in a *Yug*, which is known from the *Pancha Sid-*
" *dhánta* compoſed by VARA A'CHA'RYA, wherein are propoſed two methods of
" computing the ſun's place, the one according to the *Súrya Siddhánta*, the other
" according to *Rómacá Siddhánta*; whence it appears, that there were different
" rules of computation even among the *Munis*. It is alſo mentioned in the *Tícà*
" on the *Varáha Sanhitá*, that, according to the *Paulaſtya Siddhánta*, there was
" formerly a different number of *Sávan* days eſtimated in a *Yug*. The maxims
" therefore of BRAHMAGUPTA and the other two, agreeing with thoſe of the
" *Munis*, are right; but, ſhould it even be ſuppoſed that the *Munis* themſelves
" could be miſtaken, yet BRAHMAGUPTA and the other two had the ſanction of
" the *Védas*, which in their numerous *Sác'has* (branches) have diſagreements of
" the ſame kind; and, according to the *Sácalya Sanhità*, BRAHMA, in the revela-
" tion he made to NA'RED, told him, although a circumſtance or thing were not
" perceptible to the ſenſes, or reconcilable to reaſon, if authority for believing it
" ſhould be found in the *Védas*, it muſt be received as true.

" If a planet's place, computed both by the *Súrya Siddhánta* and *Paráſera Sid-*
" *dhánta*, ſhould be found to differ, which rule muſt be received as right? I an-
" ſwer, that which agrees with his place by obſervation; and the *Munis* gave the
" ſame direction. If computations from the beginning of the *Calpa*, and from
" the period ſtated in the *Súrya Siddhánta* give a difference, as appears in the in-
" ſtance of *Mangala*, which of the two periods to be computed from is founded
" in truth? I ſay, it is of no conſequence to us which; ſince our object is only
" to know which period anſwers for computation of the planetary places in our
" time, not at the beginning of the *Calpa*. The difference found in computing
" according to BRAHMAGUPTA and the *Munis* muſt be corrected by an allow-

" ance

" ance of *Bíja*; or by taking that difference as the *csʃhépa*; but the books of the " *Munis* muſt not be altered, and the rules given by BRAHMAGUPTA, VARA'- " CHA'RYA, and A'RYABHATTA may be uſed with ſuch precautions. Any perſon " may compoſe a ſet of rules for the common purpoſes of aſtronomy; but, with " regard to the duties neceſſary in eclipſes, the computation muſt be made by the " books of the *Munis*, and the *Bíja* applied; and in this manner it was that VA- " RA'HA, A'RYABHATTA, BRAHMAGUPTA, and CE'SAVA SAMVATSARA, hav- " ing obſerved the planets and made due allowance of *Bíja*, compoſed their books.

" GANE'SA mentions, that the *Grahas* were right in their computed places in " the time of BRAHMA', A'CHA'RYA, VASISHT'HA, CASYAPA, and others by the " rules they gave, but in length of time they differed; after which, at the cloſe of " the *Satya* age, SU'RYA revealed to MEYA a computation of their true places. " The rules then received anſwered during the *Trétà* and *Dwápar* ages, as alſo did " other rules formed by the *Munis* during thoſe periods. In the beginning of the " *Cali Yug*, PARA'SERA's book anſwered; but A'RYABHATTA, many years after, " having examined the heavens, found ſome deviation, and introduced a correction " of *bíja*. After him, when further deviations were obſerved, DURGA' SINHA, " MIHIRA and others made corrections. After them came the ſon of JISTNU " and BRAHMAGUPTA and made corrections. After them CE'SAVA ſettled the " places of the planets, and, ſixty years after CE'SAVA, his ſon GANE'SA made " corrections."

We have now, according to the *Hindu* ſyſtem, the mean motion of the planets, their nodes and apſides, and the elapſed time ſince they were in conjunction in the firſt of *Méſha*, with which, by the rule of proportion, to determine their mean longitude for any propoſed time of the preſent year. It is however obſerved in the *Súrya Siddhánta*, that to aſſume a period ſo great is unneceſſary; for uſe the computation may be made from the beginning of the *Trétà* age, at which inſtant all the *Grahas*, or moveable points in the heavens, were again in conjunction in *Méſha*, except the apogees and aſcending nodes, which muſt, therefore, be computed from the creation. The ſame is true of the beginning of the preſent *Cali* age; for the greateſt common diviſor of the number of days compoſing the *Mahà Yug* and the planetary revolutions in that period, is four, which quotes 394479457 days or 1080000 years, and the *Trétà* and *Dwápar* ages contain together juſt that number of years. The preſent *Hindu* aſtronomers therefore find it unneceſſary to go farther back

back than the beginning of the *Cali Yug* * in determining the mean longitude of the planets themſelves; but for the poſition of their apſides and nodes, the elapſed time ſince the creation muſt be uſed; or at leaſt in inſtances, as of the ſun, when the numbers 387 and 4320000000 are incommenſurable but by unity. I have however in the accompanying computation, taken the latter period in both caſes.

For the equation of the mean to the true anomaly, in which the ſolution of triangles is concerned, and which is next to be conſidered, the *Hindus* make uſe of a canon of ſines conſtructed according to the *Súrya Siddhánta* in the following manner.—" Divide the number of minutes contained in one ſign 1800 by eight, the " quotient 225′ is the firſt *Jyápinda*, or, the firſt of the twenty-fourth portions of " half the ſtring of the bow. Divide the firſt *Jyápinda* by 225′, the quotient 1′ " deduct from the dividend, and the remainder 224′ add to the firſt for the ſecond " *Jyápinda* 449′. Divide the ſecond *Jyápinda* by 225′, the quotient being 1′ and " the fraction more than half a minute, deduct 2′ from the foregoing remainder " 224′ and add the remainder, ſo found, to the ſecond for the third *Jyápinda* 671′. " Divide this by 225′, the quotient 3′ deduct from the laſt remainder 222′; the " remainder ſo found 219′ add to the third for the fourth *Jyápinda* 890′. Divide " this by 225′ and the quotient deduct from the laſt remainder, the remainder ſo " found add to the fourth for the fifth *Jyápinda* 1105, and proceed in this manner " until the twenty-four *Cramajyás* † are completed, which will be as follows:

1	2	3	4	5	6	7	8	9	10	11	12
" 225,	449,	671,	890,	1105,	1315,	1520,	1719,	1910,	2093,	2267,	2431,
13	14	15	16	17	18	19	20	21	22	23	24
" 2585,	2728,	2859,	2978,	3084,	3177,	3256,	3321,	3372,	3409,	3431,	3438.

" For the *utcramajyà* ‡, the twenty-third *cramajyà* deducted from the *trijyá* or " twenty-fourth *cramajyà*, leaves the firſt *utcramajyà*; the twenty-ſecond deducted from the twenty-third leaves the ſecond *utcramajyà*; the twenty-firſt from " the twenty-ſecond leaves the third; the twentieth from the twenty-firſt leaves " the fourth. In the ſame manner proceed until the *utcramajyà's* are com-

* Neither do they in computing by the formulas in common uſe go farther back than to ſome aſſigned date of the era *Saca*, but, having the planets' places determined for that point of time, they compute their mean places and other requiſites for any propoſed date afterwards by tables, or by combinations of figures contrived to facilitate the work: as in *Grahalághava*, *Siddhánta Rahaſya* and many other books. An inquirer into *Hindu* aſtronomy having acceſs to ſuch books only, might eaſily be led to aſſert that the *Bráhmans* compute eclipſes *by ſet forms couched in enigmatical verſes*, out of which it would be difficult to develop their ſyſtem of aſtronomy; and this I apprehend was the caſe with Monſ. SONNERAT. The *Jyótiſh Pandits* in general, it is true, know little more of aſtronomy than they learn from ſuch books, and they are conſequently very ignorant of the principles of the ſcience: but there are ſome to be met with, who are better informed.

† *Cramajyás*, Right Sines.

‡ *Utcramajyàs*, Verſed Sines.

" pleted; which will be as follows: [1] 7, [2] 29, [3] 66, [4] 117, [5] 182, [6] 261, [7] 354, [8] 460, [9] 579, " [10] 710, [11] 853, [12] 1007, [13] 1171, [14] 1345, [15] 1528, [16] 1719, [17] 1928, [18] 2123, [19] 2233, [20] 2548, [21] 2767, " [22] 2989, [23] 3213, [24] 3438." So far the *Súrya Siddhánta* on the ſubject of the ſines. The commentator ſhows how they are geometrically conſtructed: " with a radius " deſcribe a circle, the periphery of which divide into 21600 equal parts or mi- " nutes. Draw North and South, and Eaſt and Weſt lines through the centre: " ſet off contrariwiſe from the eaſt point, 225 on the periphery, and draw a ſtring " from thoſe extremities acroſs the *trijyà* *. The ſtring is the *jyà*, and its half the " *ardhajyà* called *jivà*. The *Pandits* ſay, a planet's place will correſpond with the " *ardhajyà*, by which, therefore, computations of their places are always made, " and by the term *jyà* is always underſtood the *ardhajyà*. The firſt *jyà* will be " found to contain 449 minutes, and the operation, repeated to twenty-four divi- " ſions, will complete the *cramajyà*. In each operation, the diſtance contained " between the *jyà* and its arc, or, that line which repreſents the arrow of a bow, " muſt be examined, and the number of minutes therein contained taken for the " *utcramajyà*. The circle may repreſent any ſpace of land; the *bhujajyà* † is the " *bhuja*; the *cótijyà* the *cóti*, and the *trijyà* the *carna*. The ſquare of the *bhujajyà* " deducted from the ſquare of the *trijyà* leaves the ſquare of the *cótijyà*; the root " of which is the *cótijyà*; and, in the ſame manner, from the *cótijyà* is determined " the *bhujajyà*. The *cótyutcramajyà* deducted from the *trijyà* leaves the *bhujacra-* " *majyà*. The *bhujótcramajyà* deducted from the *trijyà* leaves the *cóticramajyà*. " When the *bhujajyà* is the firſt diviſion of the *trijyà*, the *cótijyà* is the twenty- " three remaining diviſions, which *cótijyà* deducted from the *trijyà* leaves the " *bhujótcramajyà*. On this principle are the *jyàs* given in the text ‡: they may be " determined by calculation alſo, as follows:

" The *trijyà* take as equal to 3438 minutes and containing twenty-four *jyápin-* " *das*: its half is the *jyà* of one ſign or 1719′: which is the eighth *jyápinda* or the " ſixteenth *cotijyápinda*. The ſquare of the *trijyà* multiply by three, and divide " the product by four, the ſquare root of the quotient is the *jyà* of two ſigns or " 2977′. The ſquare root of half the ſquare of the *trijyà* is the *jyà* of one ſign " and an half (45°) or 2431′; which deducted from the *trijyà* leaves the *utcra-*

* *Trijyà*, the Radius. † *Bhujajyà*, the Sine complement.

‡ A diagram might here be added for illuſtration, but it muſt be unneceſſary to any one who has the ſmalleſt knowledge of geometry.

" majyà

" *mayjà* 1007′. By this *utcramajyà* multiply the *trijyà*; the ſquare root of half " the product is the *jyà* of 22°, 30′, or 1315′. The ſquare of this deduct from " the ſquare of the *trijyà*, the ſquare root of the difference is the *jyà* of 67°, 30′, " or 3177′, which is the *cótijyà* of 22°, 30′, equal to 1315′. This *bhujajyà* and " *cótijyà* deducted ſeverally from the *trijyà*, leaves the *utcramajyà* of each, 2123′, " and 261′.—&c."

This is ſufficient to ſhow, that the *Hindus* have the right conſtruction of the ſines, although they do not appear, from any thing I can learn, ever to have carried it farther than to twenty-four diviſions of the quadrant, as in the following table. Inſtances of the like inaccuracy will occur in the courſe of this paper. The table of ſines may perhaps be more clearly repreſented in the following manner.

Right Sines, the Radius containing 3438 *Minutes.*

Arc.	*Sine.*	*Arc.*	*Sine.*	*Arc.*	*Sine.*
1*ſt* = 225′ = 3°,45′	225′	9*th* = 2025′ = 33°,45′	1910′	17*th* = 3825′ = 63°,45′	3084′
2*d* = 450 = 7 ,30	449	10*th* = 2250 = 37 ,30	2093	18*th* = 4050 = 67 ,30	3177
3*d* = 675 = 11 ,15	671	11*th* = 2475 = 41 ,15	2267	19*th* = 4275 = 71 ,15	3256
4*th* = 900 = 15 ,—	890	12*th* = 2700 = 45 ,—	2431	20*th* = 4500 = 75 ,—	3321
5*th* = 1125 = 18 ,45	1105	13*th* = 2925 = 48 ,45	2585	21*ſt* = 4725 = 78 ,45	3376
6*th* = 1350 = 22 ,30	1315	14*th* = 3150 = 52 ,30	2728	22*d* = 4950 = 82 ,30	3409
7*th* = 1575 = 26 ,15	1520	15*th* = 3275 = 56 ,15	2859	23*d* = 5175 = 86 ,15	3431
8*th* = 1800 = 30 ,—	1719	16*th* = 3600 = 60 ,—	2978	24*th* = 5400 = 90 ,—	3438

Verſed Sines.

Arc.	*Sine.*	*Arc.*	*Sine.*	*Arc.*	*Sine.*
1*ſt* = 225′ = 3°,45′	7′	9*th* = 2025′ = 33°,45′	579′	17*th* = 3825′ = 63°,45′	1928′
2*d* = 450 = 7 ,30	29	10*th* = 2250 = 37 ,30	710	18*th* = 4050 = 67 ,30	2123
3*d* = 675 = 11 ,15	66	11*th* = 2475 = 41 ,15	853	19*th* = 4275 = 71 ,15	2233
4*th* = 900 = 15 ,—	117	12*th* = 2700 = 45 ,—	1007	20*th* = 4500 = 75 ,—	2548
5*th* = 1125 = 18 ,45	182	13*th* = 2925 = 48 ,45	1171	21*ſt* = 4725 = 78 ,45	2767
6*th* = 1350 = 22 ,30	261	14*th* = 3150 = 52 ,30	1345	22*d* = 4950 = 82 ,30	2989
7*th* = 1575 = 26 ,15	354	15*th* = 3275 = 56 ,15	1528	23*d* = 5175 = 86 ,15	3213
8*th* = 1800 = 30 ,—	466	16*th* = 3600 = 60 ,—	1719	24*th* = 5400 = 90 ,—	3438

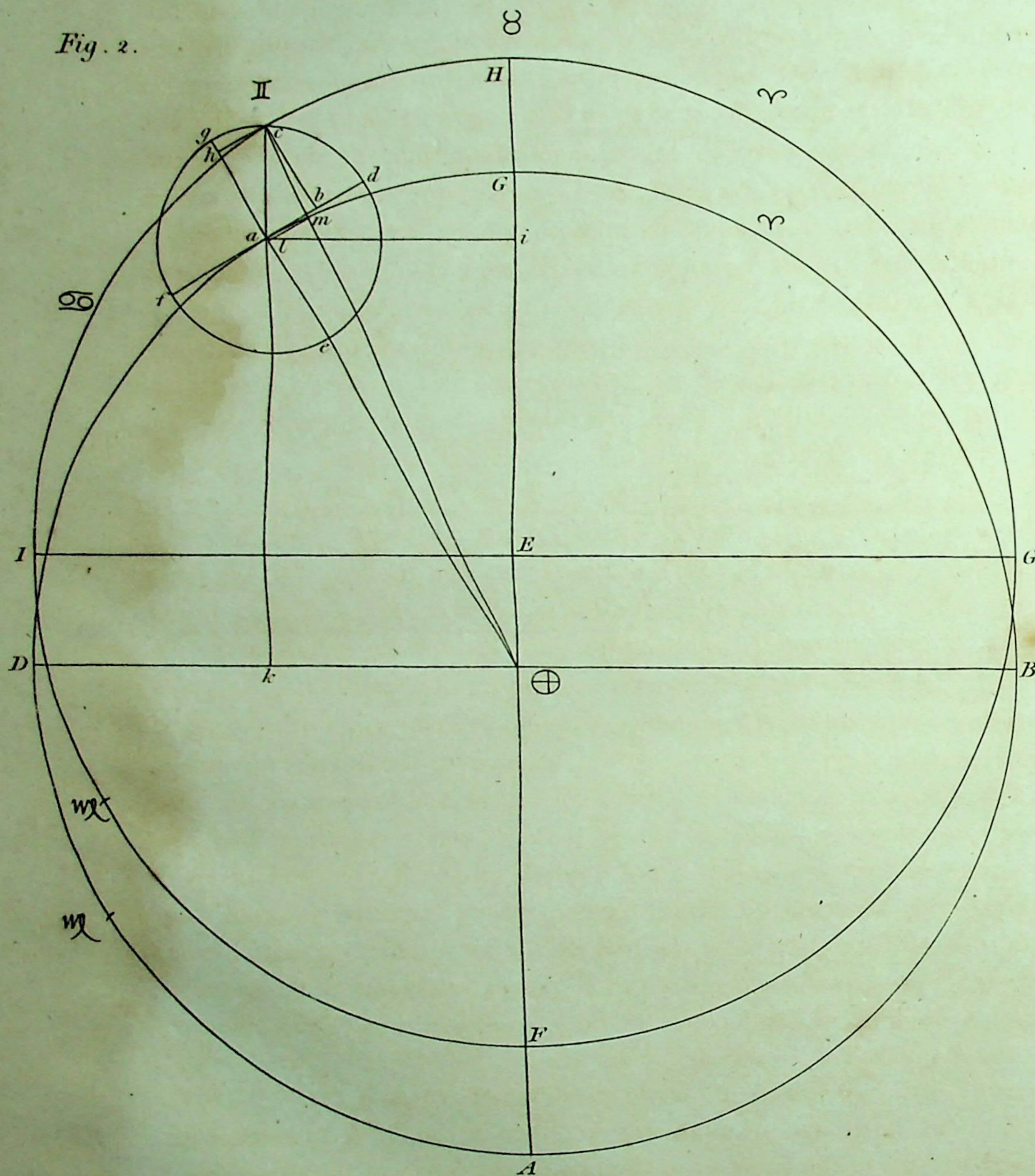
For the ſines of the intermediate arcs, take a mean proportion of the tabular difference, as for the ſine of 14°, which is between the third and fourth tabular arcs, or 165 minutes exceeding the third; therefore 225′ being the difference of thoſe arcs,

arcs, and 219 the difference of their fines, $\frac{165' \times 219'}{225} = 160', 36''$, or a mean proportional number, to be added to the fine of the third tabular arc, for the fine required of 14° or 831′ 36″. In the fexagefimal arithmetick, which appears to be univerfally ufed in the *Hindu* aftronomy, when the fraction exceeds half unity, it is ufually taken as a whole number; thus, 831′, 35″, 35‴, would be written 831′, 36″.

To account for the apparent unequal motion of the planets, which they fuppofe to move in their refpective orbits through equal diftances in equal times, the *Hindus* have recourfe to excentrick circles, and determine the excentricity of the orbits of the fun and moon with refpect to that circle, in which they place the earth as the centre of the univerfe, to be equal to the fines of their greateft anomaliftick equations, and accordingly that the delineation of the path of either may be made in the following manner:

Defcribe a circle, which divide as the ecliptick into figns, degrees, and minutes; note the place of the *Mandóchcha*, or higher apfis, which fuppofe in ♉. Draw a diameter to that point, and fet off, from the centre ⊕ towards the place of the apogee, the excentricity equal to the fine of the greateft equation, which of the fun is 130′ 32″. Here the excentricity is reprefented much greater, that the figure may be better underftood. Round the point E, as the centre, defcribe the excentrick circle FGHI, which is the fun's orbit, and in the point H, where it is cut by the line ⊕ ♉ prolonged, is the place of the *Mandóchcha*, or higher apfis, and in the oppofite point F is the lower. From the place of the apogee H, fet off its longitude in reverfe, or contrary to the order of the figns, for the beginning of *Aries*, and divide this circle, as the former, into figns and degrees. Note the fun's mean longitude in each circle, as fuppofe in *Gemini*, and from both points draw right lines to the earth at ⊕: according to the *Hindu* fyftem, which appears to be the fame as the *Ptolemaick*, the angle $a \oplus C$, will be the mean anomaly, the angle $b \oplus C$, the true anomaly, and the angle $a \oplus b$, their difference, or the equation of the mean to the true place; to be fubtracted in the firft fix figns of anomaly, and added in the laft fix. The *Europeans* in the old aftronomy found the angle $b \oplus C$ by the following proportion, and which fubtracted from $a \oplus C$ left the equation, which, as the *Hindus*, they inferted in tables calculated for the feveral degrees of the quadrant;—as the co-fine of the mean anomaly $\oplus e = Ed$ added to the excentricity $E\oplus$, is to the fine of the mean anomaly $ae = bd$; fo is radius, to the tangent of the true anomaly: or, in the right-angled triangle $d \oplus b$, in which are given $d \oplus$ and bd, if

Fig. 1.


Fig. 2.
♉
H
♊
g
c
h
d
G
b
m
a
l
i
♈
♈
♋
f
e
I
E
G
D
k
⊕
B
♍
♍
F
A

if $d\oplus$ be made radius, *bd* will be the tangent of the angle $b\oplus d$, required. The *Hindus* who have not the invention of *tangents*, take a different method, on principles equally true. They imagine the ſmall circle or epicycle, *cdef*, drawn round the planet's mean place *a* with a radius equal to the excentricity, which in this caſe, of the ſun, is 130′ 30″, and whoſe circumference in degrees, or equal diviſions of the deferent ABCD, will be in proportion as their ſemi-diameters; or, as $\oplus C=3438'$, to ABCD=360°, ſo $ag=130'\ 32''$, to $efgd=13°\ 40'$, which is called the *paridhi-anſa* or *paridhi* degrees. In the ſame proportion alſo will be the correſpondent ſines *hc* and *ai*, and their co-ſines *cb* and *lk*, which are therefore known by computation, in minutes, or equal parts of the radius $a\oplus$, which contains, as before mentioned 3438′. In the right-angled triangle $b\oplus c$, right-angled at *b*, there are given the ſides $b\oplus$ $(=a\oplus+cb$, becauſe $cb=ba)$, and *bc*; to find the hypotenuſe $c\oplus$, by means of which the angle $a\oplus m$ may be determined; for its ſine is *lm*, and, in the ſimilar triangles $bc\oplus$ and $lm\oplus$, as $c\oplus$ is to $m\oplus$, ſo is *bc* to *lm*, the ſine of the angle of equation. From the third to the ninth ſigns of anomaly, the coſine *cb* muſt be ſubtracted from the radius 3438′ for the ſide $b\oplus$.

It is, however, only in computing the retrogradations and other particulars reſpecting the planets *Mercury*, *Venus*, *Mars*, *Jupiter* and *Saturn*, where circles greatly excentrick are to be conſidered, that the *Hindus* find the length of the *carna* or hypotenuſe $c\oplus$; in other caſes, as for the anomaliſtick equations of the ſun and moon, they are ſatisfied to take *bc* as equal to the ſine *lm*, their difference, as the commentator on the *Súrya Siddhánta* obſerves, being inconſiderable.

Upon this hypotheſis are the *Hindu* tables of anomaly computed with the aid of an adjuſtment, which, as far as I know, may be peculiar to themſelves. Finding, that, in the firſt degree of anomaly both from the higher and lower apſis, the difference between the mean and obſerved places of the planets was greater than became thus accounted for, they enlarged the epicycle in the apogee and perigee, proportionably to that obſerved difference, for each planet reſpectively, conceiving it to diminiſh in inverſe proportion to the ſine of the mean anomaly, until at the diſtance of three ſigns, or half way between thoſe points, the radius of the epicycle ſhould be equal to the excentricity or ſine of the greateſt equation. This aſſumed difference in the magnitude of the epicycle, they called the difference of the *paridhianſa*, between *viſhama* and *ſama*, the literal meaning of which is *odd* and *even.* From the firſt to the third ſign of anomaly, or rather in the third, a planet is in *viſhama*; from the third to the ſixth, or in the perigee, in *ſama*; in the ninth ſign, in

in *viſhama*; and in the twelfth, or the apogee, in *ſama*. The *paridhi* degrees, or circumference of the epicycle, in *ſama* are, of the ſun 14° in *viſhama* 13° 40′; of the moon in *ſama* 32°, in *viſhama*, 31° 40′; the difference aſſigned to each between *ſama* and *viſhama*, 20′.

To illuſtrate theſe matters by examples, let it be required to find the equation of the ſun's mean, to his true place in the firſt degree of anomaly. The ſine of 1° is conſidered as equal to its arc, or 60.—The circumference of the epicycle in *ſama*, or the *apogee*, is 14°, but diminiſhing in this caſe towards *viſhama*, in inverſe proportion to the ſine of anomaly.—Therefore, as radius 3438 is to the difference between *ſama* and *viſhama* 20′, ſo is the ſine of anomaly 60′ to the diminution of the epicycle in the point of anomaly propoſed, 20″ $(=\frac{60' + 20'}{3438})$ which ſubtracted from 14° leaves 13° 59′ 40″. Then, as the circumference of the great circle 360° is to the circumference of the epicycle 13° 59′ 40″; ſo is the ſine of anomaly 60′ to its correſpondent ſine in the epicycle *bc*, which, as was obſerved, is conſidered as equal to *lm*, or true ſine of the angle of equation 2′ 19″ 56‴ $(\frac{=13°\ 59'\ 40'' + 60'}{360°})$, which, in the *Hindu* canon of ſines, is the ſame as its arc, and is therefore the equation of the mean to the true place in 1° of anomaly, to be added in the firſt ſix ſigns and ſubtracted in the laſt ſix.

For the equation of the mean to the true place in 5° 14′ of anomaly. The ſine of 5° 14′ is 313′ 36″ 8‴ and $\frac{313'\ 36''\ 8''' + 20' = 6272'\ 2''\ 40'''}{3438'} = 1'\ 49''$, to be deducted from the *paridhi* degrees in *ſama*.—14° 1′ 49″ = 13° 58′ 11″, and $\frac{313'\ 36''\ 8''' + 13°\ 58'\ 11'' = 4379'\ 59''\ 37'}{360°}$ $= 14'\ 9''\ 59'''$ the ſine of the angle of equation, which is equal to its arc.

For the ſame in 14° of anomaly. The ſine of 14° is 831′ 36″—$\frac{831'\ 36'' \times 20'}{3438'} = 4'\ 50''$, and, $\frac{14° - 4'\ 50'' \times 831'\ 38''}{360°} = 32'\ 9''$ the ſine of the angle of equation.

For the ſame in two ſigns of anomaly. The ſine of 60° is 2978′ $\frac{2978' \times 20'}{3438'} = 17'\ 19''$, and $\frac{14° - 17'\ 19'' \times 2978'}{360°} = 113'\ 25''\ 20'''$, the ſine of the equation, equal to its arc.

For the equation of the mean to the true place of the moon in 1° of anomaly. The *paridhi* degrees of the moon in *ſama* are 32°, *in viſhama* 31° 40′, the difference 20′. The ſine of 1° is 60′ and $\frac{60' \times 20''}{3438'} = 21''$, to be deducted from the *paridhi* degrees in *ſama*, 32°—21″ = 31° 59′ 39″. $\frac{31°\ 59'\ 39'' + 60'}{360°} = 5'\ 20''$, the equation required.

For

For the ſame in ten degrees of anomaly. The ſine of $10°$ is $597'$ $\frac{597' \times 20'}{3438'} = 3'\ 28''$, and $\frac{32° - 3'\ 28'' \times 597'}{360°} = 52'\ 58''$, the equation required.

For the ſame in three ſigns of anomaly. The ſine of $90°$ is the radius or $3438'$, and $\frac{3438' \times 20'}{3438'} = 20'$, $\frac{32° - 20' \times 3438'}{360°} = 302'\ 25''$, the ſine of the greateſt ang[illegible] of equation, equal to the radius of the epicycle in this point of anomaly, the [illegible]c correſponding with which is $302'\ 45''$, the equation required.

For the equation of the mean to the true motion in theſe ſeveral points of anomaly, ſay, as radius 3438, is to the mean motion, ſo is the co-ſine *c b* of the anomaliſtick angle *g a c* in the epicycle, to the difference between the mean and apparent motion, or the equation required, to be ſubtracted from the mean motion in the firſt three ſigns of anomaly; added, in the next ſix; and ſubtracted in the laſt three.

EXAMPLE, for the ſun, in $5°\ 14'$ of anomaly. The co-ſine of $5°\ 14'$ in the *Hindu* canon is $3422'\ 17''\ 52'''$. The *paridhi* circle in this point found before is $13°\ 58'\ 11''$; and $\frac{3422'\ 17''\ 52''' + 13°\ 58'\ 11''}{360°} = 132'\ 48''$, the co-ſine *c b* in the epicycle; then, as radius $3438'$ is to the ſun's mean motion $59'\ 8''$ per day, or $59''\ 8'''$ per *danda*; ſo is the co-ſine $c\,b = 132'\ 48''$, to the equation required, $2'\ 17''$ per day, or $2''\ 17'''$ per *danda*. The motion of the ſun's apſis is ſo ſlow as to be neglected in theſe calculations; but that of the moon is conſidered, in order to know her mean motion from her apogee, which is $783'\ 54''$.

In this manner may be determined the equation of the mean to the true anomaly and motion for each degree of the quadrant, and which will be found to agree with the tables of *Macaranda*. The following tables are tranſlated from that book:

Solar Equations, *Ravi p'hala.*

Anomaly.	Eq. of the mean to the true place.	Eq. of the mean to the true motion.	Anomaly.	Eq. of the mean to the true place.	Eq. of the mean to the true motion.	Anomaly.	Eq. of the mean to the true place.	Eq. of the mean to the true motion.
°	° ′ ″	′ ″	°	° ′ ″	′ ″	°	° ′ ″	′ ″
1	2 20	2 18	31	1 8 —	1 55	61	1 54 30	1 4
2	4 40	2 18	32	1 9 57	1 53	62	1 55 34	1
3	7 —	2 18	33	1 11 57	1 53	63	1 56 35	58
4	9 19	2 17	34	1 13 47	1 51	64	1 57 34	57
5	11 37	2 17	35	1 15 40	1 51	65	1 68 34	55
6	13 56	2 17	36	1 17 32	1 49	66	1 59 30	55
7	16 15	2 16	37	1 19 23	1 47	67	2 — 23	52
8	18 33	2 16	38	1 21 11	1 45	68	2 1 14	49
9	20 51	2 15	39	1 22 57	1 43	69	2 2 4	46
10	23 7	2 14	40	1 24 42	1 42	70	2 2 51	43
11	25 23	2 14	41	1 26 26	1 40	71	2 3 35	41
12	27 39	2 13	42	1 28 7	1 38	72	2 4 17	39
13	29 55	2 13	43	1 29 46	1 36	73	2 4 57	37
14	32 10	2 12	44	1 31 23	1 34	74	2 5 35	35
15	34 24	2 11	45	1 32 58	1 32	75	2 6 12	32
16	36 37	2 11	46	1 34 32	1 30	76	2 6 45	31
17	38 39	2 10	47	1 36 4	1 29	77	2 7 17	28
18	41 1	2 9	48	1 37 35	1 28	78	2 7 45	25
19	43 12	2 8	49	1 39 6	1 28	79	2 8 12	23
20	45 22	2 7	50	1 40 36	1 26	80	2 8 35	22
21	47 31	2 6	51	1 42 3	1 23	81	2 8 58	20
22	49 39	2 6	52	1 43 26	1 19	82	2 9 18	18
23	51 47	2 5	53	1 44 45	1 16	83	2 9 36	15
24	53 53	2 3	54	1 46 2	1 14	84	2 9 51	12
25	55 57	2 2	55	1 47 17	1 13	85	2 10 3	10
26	58 1	2 1	56	1 48 33	1 13	86	2 10 13	8
27	1 — 2	2 —	57	1 49 47	1 12	87	2 10 20	6
28	1 2 53	1 58	58	1 51 —	1 11	88	2 10 27	4
29	1 4 3	1 57	59	1 52 12	1 11	89	2 10 31	1
30	1 6 2	1 56	60	1 53 25	1 8	90	2 10 32	

Lunar Equations, *Chándra p'hala.*

Anomaly.	Eq. of the mean to the true place.	Eq. of the mean to the true motion.	Anomaly.	Eq. of the mean to the true place.	Eq. of the mean to the true motion.	Anomaly.	Eq. of the mean to the true place.	Eq. of the mean to the true motion.
°	° ′ ″	′ ″	°	° ′ ″	′ ″	°	° ′ ″	′ ″
1	5 20	69 39	31	2 36 37	59 20	61	4 25 26	33 41
2	10 40	69 38	32	2 41 11	58 41	62	4 27 36	32 39
3	16 —	69 33	33	2 45 36	58 —	63	4 29 59	31 35
4	21 19	69 28	34	2 49 58	57 19	64	4 32 19	30 29
5	26 36	69 21	35	2 54 20	56 37	65	4 34 37	29 22
6	31 54	69 13	36	2 58 39	55 56	66	4 36 47	28 13
7	37 12	69 4	37	3 2 54	55 14	67	4 38 54	27 7
8	42 29	68 54	38	3 7 5	54 30	68	4 40 54	26 1
9	47 44	68 43	39	3 11 12	53 44	69	4 42 50	24 55
10	52 18	68 28	40	3 15 16	52 58	70	4 44 40	23 49
11	58 11	68 11	41	3 19 18	51 26	71	4 46 24	22 42
12	1 3 23	67 52	42	3 23 24	50 57	72	4 48 5	21 34
13	1 8 40	67 35	43	3 27 26	50 48	73	4 49 38	20 24
14	1 13 45	67 17	44	3 30 54	49 46	74	4 51 9	19 14
15	1 18 53	66 55	45	3 34 39	48 54	75	4 52 53	18 3
16	1 24 —	66 38	46	3 38 21	48 —	76	4 53 54	16 51
17	1 29 5	66 18	47	3 41 58	47 5	77	4 55 6	15 38
18	1 34 9	65 57	48	3 45 32	46 9	78	4 56 15	14 25
19	1 39 10	65 36	49	3 48 59	45 13	79	4 57 17	13 14
20	1 44 9	65 14	50	3 52 24	44 19	80	4 58 13	12 3
21	1 49 17	64 50	51	3 55 46	43 27	81	4 59 6	10 53
22	1 54 3	64 24	52	3 59 2	42 32	82	4 59 53	9 41
23	1 58 3	63 56	53	4 2 13	41 37	83	5 — 27	8 34
24	2 3 47	63 24	54	4 5 18	40 41	84	5 1 8	7 14
25	2 8 35	62 53	55	4 8 18	39 44	85	5 1 40	6 2
26	2 13 22	62 22	56	4 11 16	38 47	86	5 2 3	4 51
27	2 18 6	61 48	57	4 14 11	37 50	87	5 2 20	3 40
28	2 22 47	61 13	58	4 17 —	36 51	88	5 2 36	2 37
29	2 27 35	60 35	59	4 19 46	35 48	89	5 2 44	1 44
30	2 32 2	59 56	60	4 22 29	34 48	90	5 2 48	— —



To face p. 285.

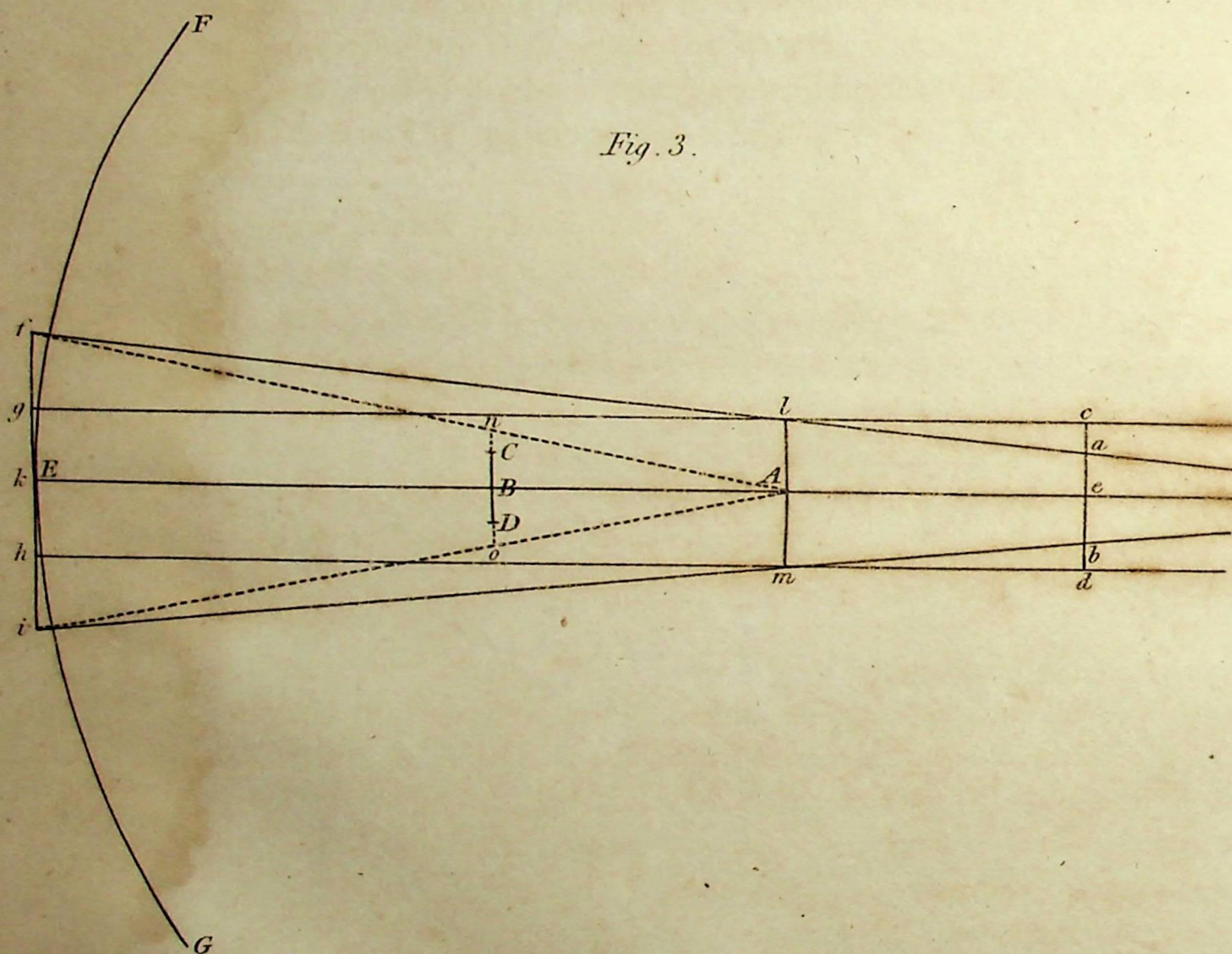


Fig. 3.

Having the true longitude of the ſun and moon, and the place of the node, determined by the methods explained, it is eaſy to judge, from the poſition of the latter, whether at the next conjunction or oppoſition there will be a ſolar, or a lunar, eclipſe; in which caſe the *tit'hi*, or date of the moon's ſynodical month, muſt be computed, from thence to determine the time counted from midnight of her full or change. Her diſtance in longitude from the ſun, divided by 720′, the minutes contained in a *tit'hi*, or the thirtieth part of 360°, the quotient ſhows the *tit'hi* ſhe has paſſed, and the fraction, if any, the part performed of the next, which, if it be the fifteenth, the difference between that fraction and 720′ is the diſtance ſhe has to go to her oppoſition, which will be in time proportioned to her actual motion, and that time being determined, her longitude, the longitude of the ſun, and place of the node may be known for the inſtant of full moon, or middle of the lunar eclipſe. The *Hindu* method of computing theſe particulars is ſo obvious in the accompanying inſtance, as to require no further deſcription here, and the ſame may be ſaid with reſpect to the declination of the ſun, and the latitude of the moon.

It is evident from what has been explained, that the *Pandits*, learned in the *Jyótiſh Sáſtra*, have truer notions of the form of the earth and the economy of the univerſe than are aſcribed to the *Hindus* in general; and that they muſt reject the ridiculous belief of the common *Bráhmens*, that eclipſes are occaſioned by the intervention of the monſter *Ráhu*, with many other particulars equally unſcientifick and abſurd. But, as this belief is founded on explicit and poſitive declarations contained in the *Védas* and *Purànas*, the divine authority of which writings no devout *Hindu* can diſpute, the aſtronomers have ſome of them cautiouſly explained ſuch paſſages in thoſe writings as diſagree with the principles of their own ſcience, and, where reconciliation was impoſſible, have apologized, as well as they could, for propoſitions neceſſarily eſtabliſhed in the practice of it, by obſerving, that certain things, as ſtated in other *Sáſtras*, "might have been ſo formerly and may be "ſo ſtill; but for aſtronomical purpoſes, aſtronomical rules muſt be followed." Others have with a bolder ſpirit attacked and refuted unphiloſophical opinions: BHA'SCARA argues, that it is more reaſonable to ſuppoſe the earth to be ſelf balanced in infinite ſpace, than that it ſhould be ſupported by a ſeries of animals, with nothing aſſignable for the laſt of them to reſt upon; and NERASINHA, in his commentary, ſhows that by *Ráhu* and *Cétu*, the head and tail of the monſter, in the ſenſe they generally bear, could only be meant the poſition of the moon's nodes

and the quantity of her latitude, on which eclipſes do certainly depend; but he does not therefore deny the reality of *Ráhu* and *Cétu*; on the contrary, he ſays, that their actual exiſtence and preſence in eclipſes ought to be believed, and may be maintained, as an article of faith, without any prejudice to aſtronomy. The following *Slóca*, to which a literal tranſlation is annexed, was evidently written by a *Jyótiſh*, and is well known to the *Pandits* in general:

Viṡ'halányanyaśáſtráni, vivádaſtéſhu cévalam:

Saṗ'halam jyótiſham śáſtram, chandrárcau yatra śácſhinau.

Fruitleſs *are all* other *Sáſtras*; in them *is* contention only: Fruitful *is* the *Jyótiſh Sáſtra*, where the ſun *and* moon *are* two witneſſes.

The argument of VARA'HA ACHA'RYA concerning the monſter *Ráhu* might here be annexed, but, as this paper will without it be ſufficiently prolix, I ſhall next proceed to ſhow, how the aſtronomical *Pandits* determine the moon's diſtance and diameter, and other requiſites for the prediction of a lunar eclipſe.

The earth they conſider as ſpherical, and imagine its diameter divided into 1600 equal parts, or *Yójanas*. An ancient method of finding a circle's circumference was to multiply the diameter by three; but this being not quite enough, the *Munis* directed that it ſhould be multiplied by the ſquare root of ten. This gives for the equatorial circumference of the earth in round numbers 5059 *Yójanas*, as it is determined in the *Súrya Siddhánta*. In the table of ſines, however, found in the ſame book, the radius being made to conſiſt of 3438 equal parts or minutes, of which equal parts the quadrant contains 5400, implies the knowledge of a much more accurate ratio of the diameter to the circumference; for by the firſt it is as 1. to 3.1627, &c. by the laſt, as 1. to 3.14136; and it is determined by the moſt approved labours of the Europeans, as 1. to 3.14159, &c. In the *Puránas* the circumference of the earth is declared to be 500,000,000 *Yójans*; and, to account for this amazing difference the commentator before quoted thought, "the *Yójan* "ſtated in the *Súrya Siddhánta* contained each 100,000 of thoſe meant in the *Puránas*; or perhaps, as ſome ſuppoſe, the earth was really of that ſize in ſome "former *Calpa*; moreover, others ſay, that from the equator ſouthward the earth "increaſes in bulk: however, for aſtronomical purpoſes, the dimenſions given by "SU'RYA muſt be aſſumed." The equatorial circumference being aſſigned, the circumference of a circle of longitude in any latitude is determined. As radius

3438

3438 is to the *Lambajyà* or ſine of the polar diſtance, equal to the complement of the latitude to ninety degrees, ſo is the equatorial dimenſion 5059, to the dimenſion in *Yójans* required.

Of a variety of methods for finding the latitude of a place, one is by an obſervation of the *palabhà*, or ſhadow projected from a perpendicular *Gnomon* when the ſun is in the equator. The *Sancu* or *Gnomon* is twelve *angulas* or digits in length, divided each into ſixty *vingulas*, and the ſhadow obſerved at *Benares* is $\overset{A}{5}\ \overset{V}{45}$. Then, by the proportion of a right-angled triangle $\sqrt{12.^2 + \overline{5{,}45}.} = \overset{A}{13}\ \overset{V}{18}$ *acſha-carna* (hypothenuſe) or diſtance from the top of the *Gnomon* to the extremity of the ſhadow; which take as radius, and the projected ſhadow will be the ſine of the zenith diſtance, in this caſe equal to the latitude of the place $\frac{3438' + \overset{A\,V}{5.45}}{\underset{13\ \ 18}{A\ \ V}} = 1487'$, the arc correſponding with which, in the canon of ſines, is 25° 26′, the latitude of *Benares.* The ſine complement of the latitude is 3101′ 57″, and again by trigonometry $\frac{3101'\ 57'' + 5059\ \overset{Y}{38}}{3438.} = 4565$, 4 *Yógans* the circumference of a circle of longitude in the latitude of *Benares.*

The longitude is directed to be found by obſervation of lunar eclipſes calculated for the firſt meridian, which the *Súrya Siddhánta* deſcribes as paſſing over *Lancá*, *Róhítaca*, *Avanti*, and *Sannihita-ſaras*. *Avanti* is ſaid by the commentator to be "now called *Ujjayinì*," or *Ougein*, a place well known to the *Engliſh* in the *Mahratta* dominions. The diſtance of *Benares* from this meridian is ſaid to be ſixty-four *Yójan* eaſtward, and as 4565 *Yójan*, a circle of longitude at *Benares*, is to ſixty *dandas* the natural day, ſo is ſixty-four *Yójan,* to $\overset{Danda}{0}\ \overset{Pala}{50}$, the difference of longitude in time, which marks the time after midnight, when, ſtrictly ſpeaking, the aſtronomical day begins at *Benares* *. A total lunar eclipſe was obſerved to happen at *Benares* fifty-one *palas* later than a calculation gave it for *Lancá*, and $\frac{51 + 4565\ 4}{60}$ = ſixty-four *Yójana,* the difference of longitude on the earth's ſuface.

According to Rennel's Map, in which may be found *Ougein,* and agreeably to the longitude aſſigned to *Benares*, the equinoctial point *Lancá* falls in the eaſtern

* "This day *(aſtronomical day)* is accounted to begin at midnight under the *réc'hà* (meridian) of *Lancá*; and at "all places eaſt or weſt of that meridian, as much ſooner or later as is their *déſántera* (longitude) reduced to time, "according to the *Súrya Siddhánta*, *Brahma Siddhánta*, *Vaſiſhtha Siddhánta*, *Sóma Siddhánta*, *Paráſera Siddhánta*, "and *Aryabhatta*. According to *Brahmagupta* and others, it begins at ſunriſe; according to the *Rómacà* and others "it begins at noon, and according to the *A'rſha Siddhánta* at ſunſet." *(Ticà* on the *Súrya Siddhánta.)*

ocean

ocean ſouthward from *Ceylon* and the *Maldiva* iſlands. *Lancá* is fabulouſly repreſented as one of four cities built by *Dévatás* at equal diſtances from each other, and alſo from *Suméru* and *Bádawánal,* the north and ſouth poles, whoſe walls are of gold, &c. and with reſpect to MEYA's performing his famous devotions, in reward of which he received the aſtronomical revelations from the ſun recorded in the *Súrya Siddhánta*, the commentator obſerves: "he performed thoſe devotions "in *Sálmala* a country a little to the eaſtward of *Lancá:* the dimenſions of *Lancá* "are equal to one twelfth part of the equatorial circumference of the earth," &c. Hence perhaps on inquiry may be found whether by *Sálmala* is not meant *Ceylon.* In the hiſtory of the war of RA'MA with RA'WAN the tyrant of *Lancá*, the latter is ſaid to have married the daughter of an *Aſura* named MEYA: but theſe diſquiſitions are foreign to my purpoſe.

For the dimenſions of the moon's *cacſhá* (orbit) the rule in the *Sanſcrit* text is more particular, than is neceſſary to be explained to any perſon, who has informed himſelf of the methods uſed by *European* aſtronomers to determine the moon's horizontal parallax. In general terms, it is, to obſerve the moon's altitude, and thence with other requiſites to compute the time of her aſcenſion from the ſenſible *cſhitija*, or horizon, and her diſtance from the ſun when upon the rational horizon, by which to find the time of her paſſage from the one point to the other; or, in other words, 'to find the difference in time between the meridian, to which the 'eye referred her at riſing, and the meridian ſhe was actually upon;' in which difference of time ſhe will have paſſed through a ſpace equal to the earth's ſemidiameter or 800 *Yójan:* and by proportion, as that time is to her periodical month, ſo is 800 *Yójan* to the circumference of her *cacſhá* 324000 *Yójan.* The errors ariſing from refraction, and their taking the moon's motion as along the ſine inſtead of its arc, may here be remarked; but it does not ſeem that they had any idea of the firſt *, and the latter they perhaps thought too inconſiderable to be noticed. Hence it appears, that they made the horizontal parallax $53' 20''$; and her diſtance from the earth's centre 51570 *Yójan*; for $\frac{180^\circ + 1600}{324000} = 53' 20''$; and as 90° or $5400'$ is to the radius $3438'$ ſo is one fourth of her orbit 81000 *Yójan*, to 51570, and $\frac{51570 \times 21600}{5059} = 220184$, the ſame diſtance in geographical miles. *European* aſtronomers compute the mean diſtance of the moon about 240000, which is ſomething above a

* But they are not wholly ignorant of opticks: they know the angles of *incidence* and *reflection* to be equal, and compute the place of a ſtar or planet, as it would be ſeen reflected from water or a mirror.

fifteenth

fifteenth part more than the *Hindus* found it ſo long ago as the time of MEYA, the author of the *Súrya Siddhánta.*

By the *Hindu* ſyſtem the planets are ſuppoſed to move in their reſpective orbits at the ſame rate; the dimenſions therefore of the moon's orbit being known, thoſe of the other planets are determined, according to their periodical revolutions, by proportion. As the ſun's revolutions in a *Mahá Yug* 4320000 are to the moon's revolutions in the ſame cycle 5753336, ſo is her orbit 324000 *Yójan* to the ſun's orbit 4331500 *Yójan*; and in the ſame manner for the *cacſhás* or orbits of the other planets. All true diſtance and magnitude derivable from parallax is here out of the queſtion; but the *Hindu* hypotheſis will be found to anſwer their purpoſe in determining the duration of eclipſes, &c.

For the diameters of the ſun and moon it is directed, to obſerve the time between the appearance of the limb upon the horizen, and the inſtant of the whole diſc being riſen, when their apparent motion is at a mean rate, or when in three ſigns of anomaly; then, by proportion, as that time is to a natural day, ſo are their orbits to their diameters reſpectively, which of the ſun is 6500 *Yójan*; of the moon, 480 *Yójan.* Theſe dimenſions are increaſed or diminiſhed, as they approach the lower or higher apſis, in proportion as their apparent motion exceeds or falls ſhort of the mean, for the purpoſe of computing the diameter of the earth's ſhadow at the moon, on principles which may perhaps be made more intelligible by a figure.

Let the earth's diameter be $lm = gh = cd$; the diſtance of the moon from the earth AB, and her diameter, CD. By this ſyſtem, which ſuppoſes all the planets moving at the ſame rate, the dimenſions of the ſun's orbit will exceed the moon's, in proportion as his period in time exceeds her's; let his diſtance be AE, and EFG part of his orbit. According to the foregoing computation alſo, the ſun's apparent diameter fi, at this diſtance from the earth, is 6500 *Yójan*, or rather, the angle his diameter ſubtends, when viewed in three ſigns of anomaly, would be 6500 parts of the circumference of a circle conſiſting of 4331500, and deſcribed round the earth as a centre with a radius equal to his mean diſtance, which is properly all that is meant by the *viſhcambha*, and which, therefore, is increaſed or diminiſhed according to his equated motion. This in three ſigns of anomaly is equivalent to 32′ 24″; for, as 4331500 to 360°, ſo 6500 to 32′ 24″. The *Europeans* determine the ſame to be 32′ 22″. In the ſame manner, the ſun's *viſhcambha* in the mean *cacſhà* of the moon, or the portion of her orbit in *Yójans*, included in this angle, is found, as 4331500, is to 324000, ſo is 6500 to 486 *Yójan* or n, o, of uſe in ſolar eclipſes;

eclipfes; but this I am endeavouring to explain is a lunar one. It is evident, that the diameter of the earth's fhadow at the moon will be *c*, *d*,—*c*, *a*,+*b*, *d*, or *ab* when her diftance is *Ae*; and that *c a* and *b d* will be found by the following proportion as *Ak*, is to $fi - gh = fg + hi$, fo is *Ae* to $ca + bd$. But it has been obferved, that *Ak* and *fi* are proportioned by the *Hindus* according to the moon's diftance *Ae*, the apparent motion of the fun and moon and the angles fubtended by their diameters. The *Hindu* rule therefore, ftates: as the fun's *vifhcambha* or diameter is to the moon's, fo is the difference of the diameters of the fun and earth in *Yójan's*, to a fourth number, equal to $ca + bd$ to be fubtracted from the *fúchì*, or $lm = cd$ to find *ab*; alfo, that the number of *Yójans*, thus determined as the diameters of the moon and fhadow, may be reduced to minutes of a great circle by a divifor of fifteen. For, as the minutes contained in $360° = 21600$, are to the moon's orbit in *Yójan* 324000, fo is one minute to fifteen *Yójan*.

The diameter of the moon's difc, of the earth's fhadow, and the place of the node being found, for the inftant of oppofition or full moon, the remaining part of the operation differs in no refpect, that I know of, from the method of *European* aftronomers to compute a lunar eclipfe. The tranflation of the formula for this purpofe in the *Súrya Siddhánta* is as follows. " The earth's fhadow is always fix " figns diftant from *Súrya*, and *Chandra* is eclipfed, whenever at the *purnimà* the " *páta* is found there; as is alfo *Súrya*, whenever at the end of the *amávásyà* the " *páta* is found in the place of *Súrya*; or, in either cafe, when the *páta* is nearly fo " fituated. At the end of the *amávásyà tit'hi* the figns, degrees, and minutes of " *Súrya* and *Chandra* are equal, and at the end of the *purnimà tit'hi* the difference " is exactly fix figns; take therefore the time unexpired of either of thofe *tit'hi's*, " and the motion for that time add to the *madhyama*, and the degrees and mi- " nutes of *Súrya* and *Chandra* will be equal. For the fame inftants of time com- " pute the place of the *páta* in its retrograde motion, and if it fhould be in conjunc- " tion with *Súrya* and *Chandra*, then, as from the intervention of a cloud, there " will be an obfcurity of *Súrya* or of *Chandra*. *Chandra* from the weft approaches " the earth's fhadow, which on entering, he is obfcured. For the inftant of the " *purnimà*, from the half fum of the *chandramána* and the *tamóliptamána* fubtract " the *vicfhépa*, the remainder is the *ch'channa*. If the *ch'channa* is greater * than " the *grahyamána*, the eclipfe will be total, and if lefs, the eclipfe will be propor-

* Or, when the *ch'channa* and *grahyamána* are equal, the eclipfe is *total*.

" tionally

" tionally lefs. The *grahya* and *gráhaca* deduct and alfo add, fquare the difference " and the fum feverally; fubtract the fquare of the *vicfhépa* from each of thofe " fquares, and the fquare root of each remainder multiply by fixty; divide each " product by the difference of the *gati* of *Súrya* and *Chandra*; the firft quotient " will be half the duration of the eclipfe in *dandas* and *palas*; and the fecond quo- " tient will be half the *vimardárdha* duration in *dandas* and *palas*," &c. The *ch'channa*, or portion of the difc eclipfed, is here found in degrees and minutes of a great circle; it may alfo be eftimated in *digits*, but the *angulas* or *digits* of the *Hindus* are of various dimenfions in different books.

The beginning, middle, and end of the eclipfe may now be fuppofed found for the time in *Hindu* hours, when it will happen after midnight; but, for the corre- fponding hour of the civil day, which begins at funrife, it is further neceffary to compute the length of the artificial day and night; and, for this purpofe, muft be known the *ayanánfa* or diftance of the vernal equinox from the firft of *méfha*, the fun's right afcenfion and declination, which feveral requifites fhall be mentioned in their order.

Refpecting the preceffion of the equinoxes and place of the colure, the following is a tranflation of all I can find on the fubject in the *Súrya Siddhánta* and its commentary.

Text: " The *ayanánfa* moves eaftward thirty times twenty in each *Mahá Yug*; " by that number (600) multiply the *ahargana* (number of mean folar days for " which the calculation is made) and divide the product by the *fávan* days in a *Yug*, " and of the quotient take the *bhuja*, which multiply by three, and divide the pro- " duct by ten; the quotient is the *ayanánfa*. With the *ayanánfa* correct the *graha*, " *cránti*, the *ch'háyà*, *charadala*, and other requifites to find the *pufhti* and the two " *vifhuvas*. When the *carna* is lefs than the *fúrya ch'háyà*, the *prácchacra* moves " eaftward, and the *ayanánfa* muft be added; and when more, it moves weftward, " and the *ayanánfa* muft be fubtracted.

Commentary: " By the text, the *ayana bhagana* is underftood to confift of 600 " *bhaganas* (periods) in a *Mahá Yug*; but fome perfons fay, the meaning is thirty " *bhaganas* only, and accordingly that there are 30000 *bhaganas*. Alfo that BHA'- " SCAR ACHA'RYA obferves, that, agreeably to what has been delivered by *Súrya*, " there are 30000 *bhaganas* of the *ayanánfa* in a *Calpa*. This is erroneous; for it " difagrees with the *Sáftras* of the *Rifhis*. The *Sácalya Sanhità* ftates that the " *bhaganas* of the *Cránti páta* in a *Mahá Yug* are 600 eaftward. The fame is ob-

" ferved

" ſerved in the *Vaſiſht'ha Siddhánta*, and the rule for determining the *ayanánſa* is as " follows: the expired years divide by 600, of the quotient make the *bhuja*, which " multiply by three, and divide the product by ten. The meaning of BHA'SCAR " ACHA'RYA was not, that SURYA gave 30000 as the *bhaganas* of the *ayanánſa* in " a *Calpa*, the name he uſed being *Saura* not *Súrya*, and applied to ſome other book. " From the *natánſa* is known the *crántyanſa*, and from the *crántijyà* the *bhujajyà*, " the arc of which is the *bhujánſa* of *Súrya*, including the *ayanánſa:* this for the " firſt three months; after which, for the next three months, the place of *Súrya*, " found by this mode of calculation, muſt be deducted from ſix ſigns. For the " next three months the place of *Súrya* muſt be added to ſix ſigns, and for the " laſt three months the place of *Súrya* muſt be deducted from twelve ſigns. Thus " from the ſhadow may be computed the true place of *Súrya*. For the ſame in- " ſtant of time compute his place by the *ahargana*, from which will appear whe- " ther the *ayanánſa* is to be added or ſubtracted. If the place found by the *ahar-* " *gana* be leſs than the place found by the ſhadow, the *ayanánſa* muſt be added. " In the preſent time the *ayanánſa* is added. According to the author of the *Vara-* " *ſanhità*, it was ſaid to have been formerly deducted *; and the ſouthern *ayana* of " *Súrya* to have been in the firſt half of the *nacſhatra Aſléſhà* †; and the northern " *ayana* in the beginning of *Dhaniſhtà:* that in his time the ſouthern *ayana* was in " the beginning of *Carcata*, or Cancer; and the northern in the beginning of *Ma-* " *cara*, or Capricorn.

" The *bhaganas* of the *ayanánſa* in a *Mahá Yug* are 600, the *ſaura* years in the " ſame period 4320000; one *bhagana* of the *ayanánſa* therefore contains 7200 " years. Of a *bhagana* there are four *pádas*. *Firſt páda:* when there was no " *ayanánſa*; but the *ayanánſa* beginning from that time and increaſing, it was add- " ed. It continued increaſing 1800 years; when, it became at its utmoſt or

* " It was ſaid to have been formerly *rina*." In the *Hindu* ſpecious arithmetick, or algebra, *dhana* ſignifies affirmation or addition, and *rina* negation or ſubtraction: the ſign of the latter is a point placed over the figure or the quantity noted down; thus, 4 added to 7̇, is equal to 3̇. See the *bija ganita*, where the mode of computation is explained thus: when a man has four pieces of money, and owes ſeven of the ſame value, his circumſtances reduced to the form of an equation or his books balanced, ſhow a deficiency of three pieces.

† This deſcribes the place of the ſolſtitial colure; and according to this account of the *ayanánſa*, the equinoctial colure muſt then have paſſed through the tenth degree of the *nacſhatra Bharaní* and the 3° 20′ of *Viſác'hà*. The circumſtance, as it is mentioned in the *Vara Sanhità*, is curious and deſerving of notice. I ſhall only obſerve here, that, although it does not diſagree with the preſent ſyſtem of the *Hindus* in regard to the motion of the equinoctial points, yet the commentator on the *Varaſanhità* ſuppoſes that it muſt have been owing to ſome preternatural cauſe. The place here deſcribed of the colure is on compariſon of the *Hindu* and *European* ſpheres about 3° 40′ eaſtward of the poſition, which it is ſuppoſed by Sir I. NEWTON on the authority of EUDOXUS to have had in the *primitive* ſphere at the time of the Argonautick expedition.

" twenty-

"twenty-ſeven degrees. *Second páda:* after this it diminiſhed; but, the amount "was ſtill added, until, at the end of 1800 years more, it was diminiſhed to no-"thing. *Third páda:* the *ayanánſa* for the next 1800 years was deducted; and "the amount deducted at the end of that term was twenty-ſeven degrees. *Fourth* "*páda:* the amount deduction diminiſhed; and at the end of the next term of "1800 years, there was nothing either added or ſubtracted. The *Munis*, having "obſerved theſe circumſtances, gave rules accordingly: if in the *ſávan* days of a "*Mahá Yug* there are 600 *bhaganas*, what will be found in the *ahargana* propoſed? "which ſtatement will produce *bhaganas*, ſigns, &c. reject the *bhaganas*, and take "the *bhuja* of the remainder, which multiply by three and divide by ten, becauſe "there are four *pádas* in the *bhagana*; for if in 90°, there is a certain number "found as the *bhuja*, when the *bhuja* degrees are twenty-ſeven, what will be found? "and the numbers twenty-ſeven and ninety uſed in the computation being in the "ratio of three to ten, the latter are uſed to ſave trouble.

"There is another method of computing the *ayanánſa*; the *cránti-pátagati* is "taken at one minute per year; and according to this rule the *ayanánſa* increaſes "to twenty-four degrees; the time neceſſary for which as *one páda* is 1440 years. "This is the *gati* of the *nacſhatras* of the *cránti mandala.*

"The *nacſhatra Révati* riſes, where the *nári mandala* and the *cſhitija* interſect *, "but it has been obſerved to vary twenty-ſeven degrees north and ſouth. The "ſame variation is obſerved in the other *nacſhatras:* it is therefore rightly ſaid, that "the *chacra* moves eaſtward. The *chacra* means all the *nacſhatras.* The planets "are always found in the *nacſhatras*, and the *cránti-páta-gati* is owing to them, not "to the planets; and hence it is obſerved in the text, that the *páta* draws *chandra* "to a diſtance equal to the *cránti* degrees."

Here, to my apprehenſion, inſtead of a revolution of the equinoxes through all the ſigns in the courſe of the *Platonick* year, which would carry the firſt of *Vaiſác'h* through all the ſeaſons, is clearly implied a liberation of thoſe points from the third degree of *Piſces* to the twenty-ſeventh of *Aries*, and from the third of *Virgo* to the

* This can happen only when there is no *ayanánſa*. The *nári mandala* is the equator. The *yóga* ſtar of *Révati* is in the laſt of *Mína* (Piſces), or, which is the ſame, in the *firſt* of *Méſha* (Aries), and has no latitude in the *Hindu* tables. Hence from the *ayanánſa* and time of the beginning of the *Hindu* year may be known their Zodiacal Stars. *Révati* is the name of the twenty-ſeventh *Lunar* manſion, which comprehends the laſt 13° 20′ of *Mína*. When the *ayanánſa* was 0, as at the creation, the beginning of the *Cali Yug*, &c. the colure paſſed through the *yóga* ſtar of *Révati*. It is plain, that in this paſſage *Révati* applies either to the particular *yóga* ſtar of that name or to the laſt, or twenty-ſeventh, *Lunar* manſion in which it is ſituated. See a former note. In each *nacſhatra*, or planetary manſion, there is *one* ſtar called the *yóga*, whoſe latitude, longitude and right aſcenſion the *Hindus* have determined and inſerted in their aſtronomical tables.

twenty-ſeventh of *Libra*, and back again, in 7200 years; but, as this muſt ſeem to *Europeans* an extraordinary circumſtance to be ſtated in ſo ancient a treatiſe as the *Súrya Siddhánta*, and believed by *Hindu* aſtronomers ever ſince, I hope the above quotations may attract the attention of thoſe who are qualified for a critical examination of them, and be compared with whatever is to be found in other *Sáſtras* on the ſame ſubject. Whatever may be the reſult of ſuch an inveſtigation, there is no miſtaking the rule for determining the *ayanánſa*, which was at the beginning of the preſent year 19° 21′, and conſequently the vernal equinox in *Piſces* 10° 39′, of the *Hindu* ſphere; or, in other words, the ſun entered *Méſha* or *Aries*, and the *Hindu* year began when he was advanced 19° 21′ into the northern ſigns, according to *European* expreſſion.

The *ayanánſa* added to the ſun's longitude in the *Hindu* ſphere, gives his diſtance from the vernal equinox: of the ſun take the *bhuja*, that is, if it exceeds three ſigns, ſubtract it from ſix ſigns, if it exceeds ſix ſigns, ſubtract ſix from it; and if it exceeds nine ſigns, ſubtract it from twelve. The quantity ſo found will be the ſun's diſtance from the neareſt equinoctial point from which is found his declination—as radius is to the *paramápacramajyà*, or ſine of the greateſt declination 24°, ſo is the ſun's diſtance from the neareſt equinoctial point to the declination ſought; which will agree with the table of declination in preſent uſe, to be found in the tables of *Macaranda*, and calculated for the ſeveral degrees of the quadrant. The declination thus determined for one ſign, two ſigns, and three ſigns, is 11° 43′ 20° 38′, and the greateſt declination or the angle of inclination of the ecliptick and equator 24°. The coſines of the ſame in the *Hindu* canon are 3366′, 3217′ and 3141′; and, as the coſine of the declination for one ſign, is to the coſine of the greateſt declination, ſo is the ſign of 30° to the ſign of the right aſcenſion for a point of the ecliptic at that diſtance from either of the two *viſhuvas*, or equinoctial points. In this manner is found the right aſcenſion for the twelve ſigns of the ecliptick reckoned from the vernal equinox; and alſo, by the ſame management of triangles, the aſcenſional difference and oblique aſcenſion for any latitude: which ſeveral particulars are inſerted in the *Hindu* books as in the following table, which is calculated for *Bhágalpur* on ſuppoſition that the *palabhà* or equinoctial ſhadow is $\overset{A}{5}\ \overset{V}{30}$. By the *Lagna* of *Lancà*, *Madhyama*, or mean *Lagna*, the *Hindus* mean thoſe points of the equator which riſe reſpectively with each thirtieth degree of the ecliptick counted from *Aries* in a right ſphere, anſwering to the right aſcenſion

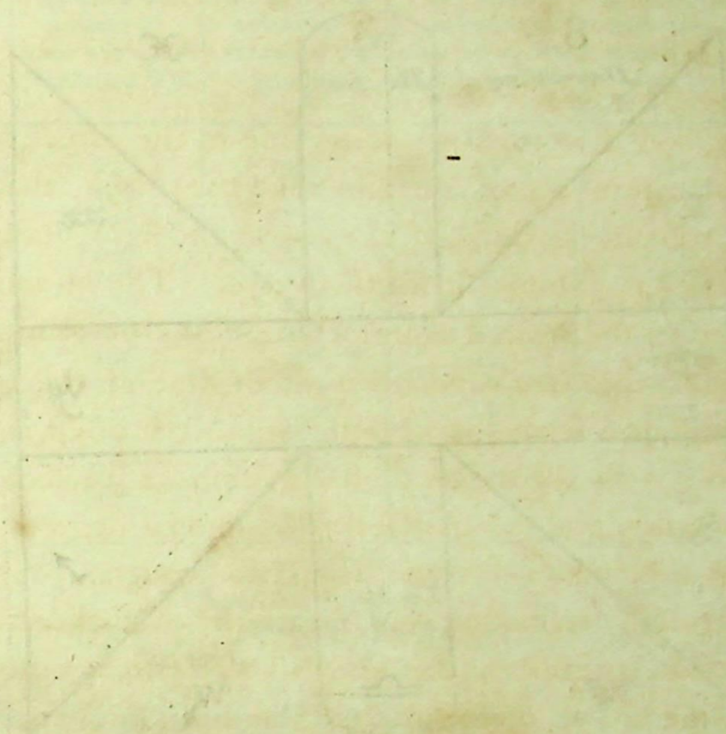
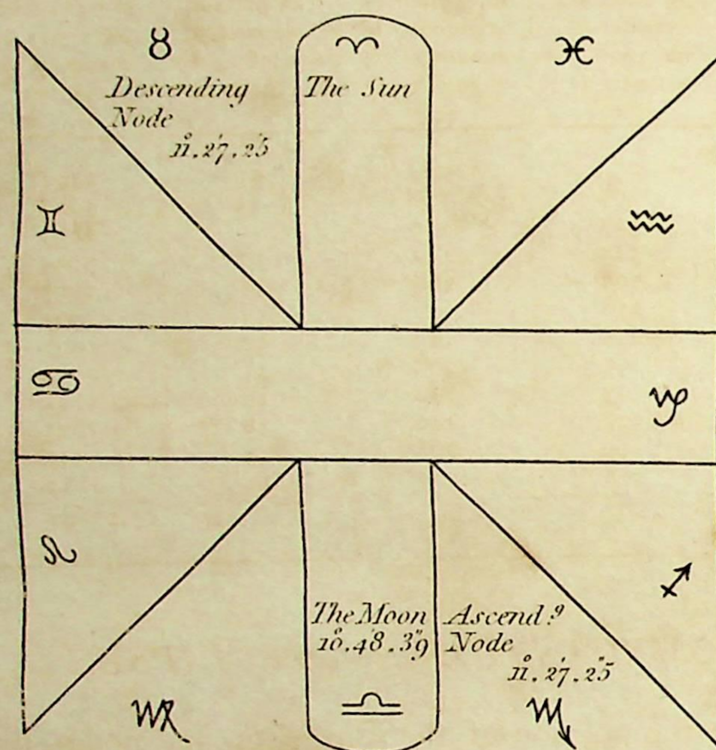


Fig. 4.th


♉
Descending
Node
11.27.25
♈
The Sun
♓
♊
♒
♋
♑
♌
♐
The Moon
10.48.39
Ascend.g
Node
11.27.25
♍
♎
♏

afcenfion in any latitude; by the *Lagna* of a particular place, the oblique afcenfion, or the divifions of the equator which rife in fucceffion with each fign in an oblique fphere, and by the *chara* the afcenfional difference.

Signs.	Lagna *of* Lancà.		Chara *of* Bhagalpur.		Ullagna.	
Hindu *Names.*	*In refpirations anfwering to minutes of the equator.*	*In* palas *or minutes of time* 3600 *to a* Nacfhatra *Day.*	*In refpirations anfwering to minutes of the equator.*	*In* palas *or minutes of time* 3600 *to a* Nacfhatra *Day.*	*In refpirations anfwering to minutes of the equator.*	*In* palas *or minutes of time* 3600 *to a* Nacfhatra *Day.*
Méfha,	1670	278	327	55	1343	224
Vrifha,	1795	299	268	45	1527	255
Mit'huna,	1935	323	110	18	1825	304
Carcata,	1935	323	110	18	2045	341
Sinha,	1795	299	268	45	2063	343
Canyà,	1670	278	327	55	1997	333
Tulà,	1670	278	327	55	1997	333
Vrifchica,	1795	299	268	45	2063	343
Dhanus,	1935	323	110	18	2045	341
Macara,	1935	323	110	18	1825	304
Cumbha,	1795	299	268	45	1527	255
Mína,	1670	278	327	55	1343	224
	21600	3600			21600	3600

The COMPUTATION of the ECLIPSE.

Let it be premifed that the pofition of the fun, moon and nodes, by calculation, will on the firft of next *Vaifác'h* be as here reprefented in the *Hindu* manner, excepting the characters of the figns.

By infpection of the figure, and by confidering the motion of the fun, moon, and nodes, it appears, that, when the fun comes to the fign *Tulà Libra*, correfponding with the month of *Cártic*, the defcending node will have gone back to *Aries*, and that confequently a *Lunar* eclipfe may be expected to happen at the end of the *purnimà tit'hi*, or time of full moon, in that month.

FIRST

FIRST OPERATION.

To find the number of mean ſolar days from the creation to ſome part of the *purnimà tit'hi* in *Cártic* of the 4891ſt year of the *Cali Yug*.

Years expired of the *Calpa* to the end of the *Satya Yug*, -	1970784000
Deduct the term of BRAHMA'S employment in the creation, -	17064000
From the creation, when the planetary motions began, to the end of the *Satya Yug*, - - - - - -	1953720000
Add, the *Trétà Yug*, - - - - - - -	1296000
Dwápar Yug, - - - - - - -	864000
Preſent year of the *Cali Yug*, - - - - -	4890
From the creation to the next approaching *Bengal* year, -	1955884890
Or Solar months (×12) - - - - - -	23470618680
Add ſeven months, - - - - - - - - -	72
	23470618680

As the ſolar months in a *Yug*, 51840000, are to the intercalary *lunar* months in that cycle 1593336, ſo are the ſolar months 23470618687, to their correſponding intercalary *lunar* months 721384677, which added together give 24192003364 lunations. This number multiplied by thirty produces 725760100920 *tit'his* or lunar days, from the creation to the new moon in *Cártic*, to which add fourteen *tit'his* for the ſame, to the *purnimà tit'his* in that month 725760100934. Then, as the number of *tit'his* in a *Yug*, 1603000080, is to their difference exceeding the mean ſolar days in that cycle (called *cſhaya tit'his*) 25082252, ſo are 725760100934 *tit'his* to their exceſs in number over the ſolar days 11356017987, which ſubtracted, leaves 714404082947, as the number of mean ſolar days from the creation, or when the planetary motions began, to a point of time which will be midnight under the firſt meridian of *Lancà*, and near the time of full moon in *Cártic* *. The firſt day after the creation being *Ravi-vár*, or *Sunday*, divide the number of days by

* In the year of the *Cali Yug* 4891 correſponding with 1196 *Bengal* ſtyle, and with the month of *October* or *November* (hereafter to be determined) in the year of CHRIST 1789.

ſeven

ſeven for the day of the week, the remainder after the diviſion being two, marks the day *Sóma-vár*, or *Monday*.

SECOND OPERATION.

For the mean longitude of the ſun, moon, and the aſcending node. Say, as the number of mean ſolar days in a *Maha Yug*, is to the revolutions of any planet in that cycle, ſo are the days from the creation, to even revolutions, which reject, and the fraction if any, turned into ſigns, &c. is the mean longitude required.

1ſt. Of the Sun.

$$\frac{714404082947 \times 4320000}{1577917828} = (1955884890)\ 6\ 22\ 44\ 2\ 12$$

(Revolutions. Signs. ° ′ ″ ‴)

2d. Of the Moon.

$$\frac{714404082947 \times 57753336}{1577917828} = (26147888255)\ 0\ 21\ 21\ 58\ 56$$

3d. Of the Moon's Apogee.

$$\frac{714404082947 \times 488203}{1577917828} = (221034460)\ 11\ 5\ 31\ 13\ 35$$

Correction of the *bíja* add.

$$\frac{714404082947 \times 4}{1577917828} = (\text{-------})\ 0\ 37\ 37\ 52\ 28$$

11 7 9 6 3

4th. Of the Moon's aſcending Node.

$$\frac{714404082947 \times 232238}{1577917828} = (105147017)\ 4\ 27\ 49\ 48\ —$$

Correction of the *bíja* add.

$$\frac{714404082947 \times 4}{1577917828} = (\text{------})\ 0\ 1\ 37\ 52\ 28$$

4 29 27 40 28

5th. Of the Sun's Apogee.

$$\frac{714404082947 \times 387}{1577917828} = (175\text{----})\ 2\ 17\ 17\ 15\ —$$

Of

	Mean longitude for midnight under the meridian of Lancà.	*Deduct for the longitude of* Bhágalpur *as* *8° 50′ *of the Equator east.*	*Mean longitude for midnight at* Bhágalpur.
Of the Sun,	6s 21° 44′ 2″ 12‴	1′ 27″	6 21 42 35 12
Moon,	— 21 21 58 56	19 34	— 21 2 25 —
Node,	4 29 27 40 28	— 4	4 29 27 36 —
Sun's Apogee,	2 17 17 15 —	inconsiderable	2 17 17 16 —
Moon's Apogee,	11 7 9 6 3	— 9	11 7 8 57 —

THIRD OPERATION.

For the equated longitude of the Sun and Moon, &c.

1st. *Of the Sun.*

The mean longitude of the sun is 6s 21° 42′ 35″ 12‴; of the apogee, 2 17 17 15; the difference, or mean anomaly, 4s 4° 25′ 20″; its complement to 6 signs, or distance from the perigee, 1s 25° 34′ 40″; the equation for which is required. This may either be taken from the foregoing table translated from *Macaranda*, or calculated in the manner explained as follows:

The sine of 1s 25° 34′ 40″ is 2835′ 31″ and $\frac{2835' 31'' \times 20'}{3438'} = 14' 30''$ to be subtracted from the *paridhi* degrees in *sama*; 14°—14′ 30″ = 13° 53′ 30″, the circumference of the epicycle in this point of anomaly; and $\frac{13° 43' 30'' \times 2835' 31''}{360°} = 108' 61''$ the sine of the angle of equation, considered as equal to its arc, or 1° 48′ 6″, to be deducted from the mean, for the true longitude; 6s 21° 42′ 35″—1° 48′ 6″=6s 19° 54′ 29″ for midnight agreeing with mean time; but as, in this point of anomaly, the true or apparent midnight precedes that estimated for mean time, for which the computation has been made, a proportionable quantity must be deducted from the sun's place, which is thus found. Say, as the minutes contained in the ecliptick are to the sun's mean motion in one day 59′ 8″, so is the equation of his mean to his true place 180′ 6″, to the equation of time required, 0′ 18″ ($= \frac{59' 8'' \times 108' 6''}{21600}$) and 6s 19° 54′ 29″—18″=6s 19° 54′ 11″ the sun's true longitude for the apparent midnight.

For the sun's true motion. The cosine of the sun's distance from the perigee is

* This longitude assigned to *Bhágalpur* is erroneous; but the error does not in the least affect the main object of the Paper.

1941′

1941′ 0″ 1‴, and $\frac{1941' \; 0'' \; 1''' \times 13 \; 43 \; 30}{360^\circ} = 74'$ the cofine of the epicycle, and $\frac{59' \; 8'' \times 74}{3438} = 1' \; 16'$ equation, to be added to the mean for the true motion 59′ 8″ × 1′ 16″ = 60′ 24″ per day, or 60″ 24‴ per *danda.*

2d. *Of the Moon.*

The moon's mean longitude for the mean midnight is 0*s* 21° 2′ 25″, which exceeds her mean longitude for the true midnight, but $\frac{108 \times 790 \; 1 \; 35}{21600} = 3' \; 57''$ her motion in the difference of time between the mean and true midnight 0*s* 21° 2′ 25″—3′ 57″=0 20 58 28 mean longitude, for which the anomaliftick equation is to be found. Place of the apogee 11*s* 7° 8′ 55″, and the moon's diftance from it 1*s* 13° 49′ 33″. The fine of the latter, 2379′ 39″. By the rule before explained $\frac{2379' \; 39' \times 20'}{3438} = 13' \; 51''$ and $\frac{32^\circ - 13' \; 51'' \times 2379' \; 39''}{360} = 210'$, the fine of the angle of equation equal to its arc, or 3° 30″, to be fubtracted, 0° 20′ 58″ 28‴—3° 30″=0° 17′ 28″ 28‴ the moon's true place, agreeing with the true or apparent midnight.

For the moon's true motion. The cofine of her diftance from the apogee 2479. 13. Circumference of the epicycle 31° 46′ 9″, and $\frac{31^\circ \; 46' \; 9'' \times 2479' \; 13''}{360^\circ} = 218' \; 47$ cofine in the epicycle. The moon's mean motion from her apogee is 790′ 35″—6′ 41″=783′ 54″, and $\frac{783' \; 54'' \times 218' \; 47''}{3438'} = 49' \; 53''$ the equation of her mean to her true motion, to be fubtracted, 790. 35—49. 53=740. 42 the moon's true motion per day, or 740″ 42‴ per *danda.*

For the place of the moon's apogee reduced to the apparent midnight. The motion of the apogee is 6′ 41″ per day. $\frac{108' \; 6'' \times 6' \; 41''}{21600'} = 2''$, 11*s* 7° 8′ 57″—2″=11*s* 7° 8′ 55″ its place.

For the fame of the node. Its motion per day is 3′ 11″, and $\frac{108' \; 6'' \times 3' \; 11''}{21600'} = 1''$, and 4*s* 29° 27′ 36″—1″=4*s* 29° 27′ 35″ its place.

The true longitude and motion, therefore, for the apparent time of midnight at *Bhágalpur*, 714404082947 folar days after the creation, or commencement of the planetary motions, will be

	Longitude.				*Motion per Day.*	
	s	°	′	″	′	″
Of the Sun,	6	19	54	11	60	24
Moon,	—	17	28	28	740	42
Sun's Apogee,	2	17	17	15	inconfiderable	
Moon's Apogee,	11	7	8	55	6	41
Moon's Node,	4	29	27	35	3	11

FOURTH

FOURTH OPERATION.

Having the longitude and motion as above, to determine the *tit'hi* and time remaining unexpired to the inſtant of oppoſition or full moon.

The moon's longitude ſubtracted from the ſun's leaves 5*s* 27° 34′ 17″, or 10654′ 17″, which divided by 720′ the minutes in a mean *tit'hi* quotes fourteen even *tit'hi's* expired, and the fraction, or remainder 574′ 17″, is the portion expired of the 15th or *purnimà tit'hi*, which ſubtracted from 720′ leaves 145′ 43″ remaining unexpired of the ſame; which, divided by the moon's motion per *danda* from the ſun, will give the time remaining unexpired from midnight to the inſtant of full moon with as much preciſion as the *Hindu* aſtronomy requires. Deduct the ſun's motion 60″ 24‴ per *danda* from the moon's 740″ 42‴, the remainder 680″ 8‴, is the moon's motion from the ſun; by this divide the part remaining unexpired of the *purnimà tit'hi* 145′ 43″.

$$\frac{145' \, 43'' = 524580'''}{680'' \, 8''' = 40818'''} = \overset{D.}{12} \; \overset{P.}{51}$$

therefore, 12 *dandas* 51 *palas* after midnight will be the end of the *purnimà tit'hi* or inſtant of oppoſition of the ſun and moon.

FIFTH OPERATION.

Having the inſtant of oppoſition as above, to find the true longitude and motion of the ſun and moon, the latitude of the latter, and the place of the node.

Add the mean motion of each for $\overset{D.}{12} \; \overset{P.}{51}$ to the mean place, found before for the true midnight; and for the mean places ſo found, compute again the anomaliſtick equations. This being but a repetition of operation, the third is unneceſſary to be detailed. Theſe ſeveral particulars are as follows:

	Mean longitude for midnight.	*Mean longitude at full Moon.*	*Equation.*	*True longitude at full moon.*
Of the Sun,	6*s* 21° 42′ 17″	6*s* 21° 54′ 17″	1° 47′ 50″	6*s* 20° 7′ 7″
Moon,	— 20 58 28	— 23 47 47	3 40 20	— 20 7 27
Moon's Apogee,	11 7 8 55	11 7 10 21	———	———
Moon's Node.	4 29 27 35	4 29 28 16	———	———

	Mean motion.	*Equation.*	*True motion at full moon.*
Of the Sun,	59′ 8″	× 1′ 16″	60′ 24″
Moon,	790 35	— 47 28	743 7

Hence

Hence it appears, that at the oppoſition the moon will be near her deſcending node; for, 4*s* 29° 28′ 16′ + 6*s*=10*s* 29° 28′ 16″, the place of the deſcending node *in antecedentia*, and 12*s*—10*s* 29° 28′ 16″= 1*s* 0° 31′ 44″ its longitude according to the order of the ſigns, and 1*s* 0° 31′ 44″—20° 7′ 27″=10° 24′ 17″ the moon's diſtance from her deſcending node, which, being within the limit of a lunar eclipſe, ſhews that the moon will be then eclipſed. For her latitude at this time, ſay, as radius, is to the inclination of her orbit to the ecliptick, 4° 30′ or 270″, ſo is the ſine of her diſtance from the node 620′ 57″; to her latitude 48′ 45″ ($=\frac{279'' + 620'\ 57''}{3438'}$).

SIXTH OPERATION.

From the elements now found, to compute the diameters of the moon and ſhadow, and the duration of the eclipſe.

	Yójan.	
The Sun's mean diameter is - - - - - -	6500	
Moon's - - - - - - - -	480.	
Earth's - - - - - - - -	1600	
Sun's mean motion, - - - - - -	59′	8″.
Moon's - - - - - - - -	790	35.
Sun's true motion, - - - - - -	60	24
Moon's - - - - - - - -	743	7
Moon's latitude, - - - - - -	48	45

As the moon's mean motion is to her mean diameter, ſo is her true motion to her true diameter for the time of oppoſition $\frac{743'\ 7'' \times 480^{r}}{790,\ 35}$=451 11 *Yójan*, which divided by fifteen quotes 30′ 5″ of a great circle.

As the ſun's mean motion is to his mean diameter, ſo is his true motion to his diameter at the inſtant of oppoſition $\frac{60'\ 24' \times 6500^{r}}{59'\ 8''}$=6639 14 *Yójan.*

As the moon's mean motion is the earth's diameter, ſo is the moon's equated motion to the *Súchì*, or a fourth number, which muſt be taken as the earth's diameter, for the purpoſe of proportioning its ſhadow to the moon's diſtance and apparent diameter $\frac{160 \times 743'\ 7'}{790'\ 35''}$=1503 56 *Yójan*, the *Súchì*.

 Equated

Equated diameter of the ſun,	6639	14
Of the Earth,	1503	56
Difference,	5039	14

As the ſun's mean diameter is to the moon's mean diameter, ſo is the difference above 5039 14, to a fourth number, which deducted from the *Súchì*, or equated diameter of the earth, leaves the diameter of the earth's ſhadow at the moon, $\frac{480^{r} \times 5039^{r}\ 14}{6500} = 372.\ 7$, and $1503.\ 56 - 372.\ 7 = 1131,\ 49$ *Yójan*, which divided by fifteen quotes 75′ 27″ of a great circle, for the ſame.

From the half ſum of the diameters of the moon and ſhadow $\frac{75'\ 27'' \times 30'\ 5''}{2} = 52'\ 46''$, ſubtract the moon's latitude 48′ 45″, the remainder is the *Chch'anna*, or portion of the moon's diameter eclipſed, 4′ 1″ of a great circle, and by the nature of a right angled triangle, the ſquare root of the difference of the ſquares of the moon's latitude, and the half ſum of the diameters of the ſhadow and moon, will be the path of the moon's centre, from the beginning to the middle of the eclipſe.

The diameter of the ſhadow is,	75	27
Of the moon, - - -	30	5
Sum, -	105	32
Half ſum, -	52	46
The moon's latitude is, - -	48	45

$\sqrt{52.\ 46^2 + 48.\ 45^2} = 20'\ 11''$ which, divided by the moon's motion from the ſun, quotes the half duration of the eclipſe, in *dandas* and *palas*, or *Hindu* mean ſolar hours, $\frac{20'\ 11'' = 1211'''}{682''\ 43''} = 1^{D}\ 46^{P}\ 25^{V}$, which doubled is $3^{D}\ 32^{P}\ 50^{V}$, the whole duration of the eclipſe; which will be partial, the moon's latitude being greater than the difference between the ſemidiameters of the moon's diſc and the earth's ſhadow.

SEVENTH

SEVENTH OPERATION.

To find the poſition of the equinoctial colures, and thence the declination of the ſun, the length of day and night, and the time counted from ſunriſe, or hour of the civil day when the eclipſe will happen.

1*ſt*. For the *ayanánſa* or diſtance of the vernal equinox from the 1ſt of *Meſha*. $\frac{714404082947 \times 600}{1577917828} = \overset{\text{Periods}}{(271650)}$ 8*s* 4° 31′ 30″ 52‴ of which take the *bhuja* 8*s* 4° 31′ 30″ 52‴ —6*s*=2*s* 4° 31′ 30″ 52‴ which multiply by three, and divide by ten, $\frac{64° \; 31' \; 30 \; 52 \times 3}{10}$ =19° 21′ 27″ the *ayanánſa*, which in the preſent age is added to the ſun's longitude, to find his diſtance from the vernal equinox. The ſun's equated longitude is 6*s* 19° 54′ 11″, and 6*s* 19° 54′ 11″×19° 21′ 27″=7*s* 9° 15′ 38″ his diſtance from the vernal equinox.

2*d*. For the declination, right aſcenſion, and aſcenſional difference. The ſun's place is 7*s* 9° 15′ 38″, and 1*s* 9° 15′ 38″ his diſtance from the autumnal equinox; the ſine of which is 2174′ 41″, and as radius is to the ſine of the greateſt declination 24°, termed the *paramápacramajyà* 1397′, ſo is 2174. 41 to the ſine of his declination 883′ 40″, the arc correſponding with which, in the canon of ſines, is 14° 53′, ($\frac{1397' \times 2174' \; 41''}{3438} = 883' \; 40''$). The equinoctial ſhadow at *Bhágalpur* is $\overset{A}{5}, \overset{V}{30}$ and, as the *Gnomon* of twelve *angalas* is to the equinoctial ſhadow, ſo is the ſine of the declination 883. 40, to the *cſhitijyà*, $\frac{\overset{A}{5} \; \overset{V}{30} \times 883' \; 40''}{3438} = 405' \; 1''$. And as the coſine of the declination is to radius, ſo is the *cſhitijyà*, to the ſine of the *chara* or aſcenſional difference $\frac{405 \; 1 \times 3438}{3322. \; 36} = 419' \; 4''$, its arc is 419′ 56″ the aſcenſional difference.

3*d*. For the length of the day and night.

The modern *Hindus* make their computations in mean ſolar time; the *Súrya Siddhánta* directs, that they be made in ſydereal time. A ſydereal day contains ſixty *dandas*; each *dandas*, ſixty *viculas*; and each *vicula* ſix reſpirations, in all 21600 reſpirations anſwering to the minutes of the equator. A *nacſhatra* day is exceeded in length by the *ſávan* or ſolar day, by reaſon of the ſun's proper motion in the ecliptick, the former meaſures time equably, but the latter varies in its length from the inequality of the ſun's motion, and the obliquity of the ecliptick. The ſun's equated motion for the middle of the eclipſe was found 60′ 24″; and the oblique aſcenſion for the eighth ſign from the vernal equinox, in which he will be found at that time, is taken from the foregoing table 343 *palas* or 2058 reſpirations.

As

As the number of the minutes contained in one ſign 1800, is the number of reſpirations, or the arc of the equator in minutes anſwering to the oblique aſcenſion of the ſign the ſun is in 2058, as above, ſo is the equated motion 60′ 24″, to the exceſs in reſpirations of the *ſávan* or ſolar day over the *nacſhatra* or ſydereal day $\frac{2058' \times 60' 24''}{1800} = 69' 3'$, which added to 21600′ gives the length of the ſolar day by civil account from ſunriſe to ſunriſe, ſydereal time 21669. 3 reſpirations. From one fourth of this deduct the aſcenſional difference, the ſun being declined towards the ſouth pole, for the ſemidiurnal arc; and add it for the ſeminocturnal arc. The former is 4997′ 19″ and the latter 5837′ 11″; which may be reduced to *dandas* or *Hindu* hours by a diviſion of 360. Hence half the day is $\overset{D}{13}\ \overset{P}{52}\ \overset{V}{53}$, and half the night $\overset{D}{16}\ \overset{P}{12}\ \overset{V}{52}$. The whole day added to half the night ſhows the hour counted from the preceding ſunriſe to midnight $\overset{D}{43}\ \overset{P}{58}\ \overset{V}{38}$, to which add the time at midnight unexpired of the *purnimà tit'hi*, for the hour of the civil day correſponding with the middle of the eclipſe. The hour from midnight to the end of the *purnimà tit'hi* is already found $\overset{D}{12}\ \overset{P}{51}$ in mean ſolar time, and to reduce it to ſydereal time, ſay, as 21600′ is to 21600′ × 59′ 8″, ſo is $\overset{D}{12}\ \overset{P}{51}$, to ſidereal hours $\overset{D}{12}\ \overset{P}{53}$, equal to $\overset{D}{12}\ \overset{P}{51}$ ſolar hours.

	D	P	V
From the preceding ſunriſe to midnight is, - - - -	43	59	—
At midnight will remain of the *purnimà tit'hi* - - - -	12	53	—
Hour of the civil day at the middle of the eclipſe, - - -	56	52	—
Deduct the half duration, - - - - - - - -	1	46	25
Beginning of the eclipſe, - - - - - - -	55	5	35
Add the whole duration, - - - - - - -	3	32	50
End of the eclipſe, - - - - - - - -	58	38	25

And the day and night containing together $\overset{D}{60}\ \overset{P}{11}\ \overset{V}{30}$, the eclipſe ſhould end $\overset{D}{1}\ \overset{P}{33}\ \overset{V}{5}$ before ſunriſe according to this calculation.

The firſt day after the creation according to the *Hindus* was *ravi-vár* or *Sunday:* the number of days, for which the above calculation has been made, is 714404082947, which divided by ſeven, the number of days in a week are 102057726135 weeks and two days; the aſtronomical day therefore of *ſoma-vár* or *Monday*, will end at midnight

midnight preceding the eclipfe; but the *foma-vár* by civil computation will continue to the next enfuing funrife, and this *foma-vár* by calculating the number of days elapfed from the inftant the fun entered the fign *Tulà*, to his advance of $19^{\circ}\ 54'$ on that fign, will be found to fall on the 19th of the month of *Cártic*, anfwering to the 3d of November.

The time of full moon and the duration of the eclipfe, found by this computation differ confiderably from the Nautical Almanack. The *Siddhánta Rahafya* and *Grahalághava*, comparatively modern treatifes, are nearer the truth, yet far from correct. The *Hindus*, in determining thefe phenomena, are fatisfied when within a few minutes of the true time.

A comparative ftatement of this eclipfe as predicted in the Nautical Almanack with computations of it made by different *Hindu* books. Thofe marked * are made for different meridians, the laft I believe for *Tirhùt*.

NAMES.	Equated longitude for midnight at *Bhágalpur*, fuppofed in 8° 50′ E. from *Lancá*, and 88° E. from *Greenwich*.		
	The Sun.	*The Moon.*	*The Node.*
	S. ° ′ ″	S. ° ′ ″	S. ° ′ ″
Súrya Siddhánta,	6 19 54 11	— 17 28 28	1 — 31 44
Tables of Macaranda,	6 19 55 9	— 17 30 9	1 — 32 7
* Grahalághava,			
Siddhánta Rahafya,	6 19 54 29	— 17 16 25	1 — 27 35
	Add to each the *ayanánfa* 19° 21′ 27″ for the longitude counted according to *European* Aftronomers from the Equinoctial colure.		
	S. ° ′ ″	S. ° ″ ′	S. ° ′ ″
Súrya Siddhánta,	7 9 15 38	1 6 49 55	1 19 53 11
Tables of Macaranda,	7 9 16 36	1 6 51 36	1 19 53 54
* Grahalághava,			
Siddhánta Rahafya,	7 9 15 56	1 6 37 52	1 19 49 2
Nautical Almanack,	7 10 47 8	1 7 50 58	1 19 45 30

	From midnight to the middle of the Eclipfe.		Duration of the Eclipfe.	
	Hindu time.	*Englifh time.*	*Hindu time.*	*Englifh time.*
	D. P. V.	H. M. S.	D P. V.	H M. S
Súrya Siddhánta,	12 53 —	5 9 12	3 12 50	1 17 8
Tables of Macaranda,			4 50 —	1 46 20
* Grahalághava,	*14 50 —	5 56 —	5 18 —	1 56 36
Siddhánta Rahafya,	13 53 —	5 33 —	4 58 —	1 49 16
* Grahana Malá, a Catalogue of Eclipfes,	16 6 —	6 26 24	5 26 —	2 10 24
Nautical Almanack,	16 — 37	6 24 15	5 22 2½	2 9 —

XVI.

XVI.

ON THE ANTIQUITY OF INDIAN ZODIAC.—*See the Works of Sir William Jones, Vol. I. p. 333.*

XVII.

AN ACCOUNT OF THE KINGDOM OF NEPA'L, BY FATHER GIUSEPPE, PREFECT OF THE ROMAN MISSION.

Communicated by JOHN SHORE, *Esq.*

THE kingdom of *Népál* is ſituated to the north eaſt of *Patna* at the diſtance of ten or eleven days' journey from that city. The common road to it lies through the kingdom of *Macwanpur*; but the miſſionaries and many other perſons enter it on the *Bettia* quarter. Within the diſtance of four days' journey from *Népál* the road is good in the plains of *Hinduſtàn*, but in the mountains it is bad, narrow, and dangerous. At the foot of the hills the country is called *Teriáni:* and there the air is very unwholeſome from the middle of *March* to the middle of *November*; and people in their paſſage catch a diſorder called, in the language of that country, *Aul*, which is a putrid fever, and of which the generality of people, who are attacked with it, die in a few days; but on the plains there is no apprehenſion of it. Although the road be very narrow and inconvenient for three or four days at the paſſes of the hills, where it is neceſſary to croſs and recroſs the river more than fifty times, yet, on reaching the interior mountain before you deſcend, you have an agreeable proſpect of the extenſive plain of *Népál*, reſembling an amphitheatre covered with populous towns and villages: the circumference of the plain is about 200 miles, a little irregular, and ſurrounded by hills on all ſides, ſo that no perſon can enter or come out of it without paſſing the mountains.

There are three principal cities in the plain, each of which was the capital of an independent kingdom; the principal city of the three is ſituated to the northward of the plain, and is called *Cat'hmándú:* it contains about 18,000 houſes; and this kingdom from ſouth to north extends to the diſtance of twelve or thirteen days' journey as far as the borders of *Tibet*, and is almoſt as extenſive from eaſt to weſt. The king of *Cat'hmándú* has always about 50,000 ſoldiers in his ſervice. The ſecond city

city to the ſouth weſt of *Cat'hmándú* is called *Lelit Pattan*, where I reſided about four years; it contains near 24,000 houſes; the ſouthern boundary of this kingdom is at the diſtance of four days' journey, bordering on the kingdom of *Macwanpur*. The third principal city to the eaſt of *Lelit Pattan* is called *B'hátgán*; it contains about 12,000 families, extends towards the eaſt to the diſtance of five or ſix days' journey, and borders upon another nation, alſo independent, called *Cirátas*, who profeſs no religion. Beſides theſe three principal cities, there are many other large and leſs conſiderable towns or fortreſſes, one of which is *Timi* and another *Cipolí*, each of which contains about 8,000 houſes, and is very populous: all thoſe towns both great and ſmall are well built; the houſes are conſtructed of brick, and are three or four ſtories high; their apartments are not lofty; they have doors and windows of wood well worked and arranged with great regularity. The ſtreets of all their towns are paved with brick or ſtone, with a regular declivity to carry off the water. In almoſt every ſtreet of the capital towns there are alſo good wells made of ſtone, from which the water paſſes through ſeveral ſtone canals for the public benefit. In every town there are large ſquare varandas well built, for the accommodation of travellers and the publick: theſe varandas are called *Pali*, and there are alſo many of them as well as wells in different parts of the country for publick uſe. There are alſo, on the outſide of the great towns, ſmall ſquare reſervoirs of water faced with brick, with a good road to walk upon, and a large flight of ſteps for the convenience of thoſe who chooſe to bathe. A piece of water of this kind on the outſide of the city of *Cat'hmándú* was at leaſt 200 feet long on each ſide of the ſquare, and every part of its workmanſhip had a good appearance.

The religion of *Népál* is of two kinds: the more ancient is profeſſed by many people who call themſelves *Baryeſu*; they pluck out all the hair from their heads; their dreſs is of coarſe red woollen cloth, and they wear a cap of the ſame: they are conſidered as people of the religious order, and their religion prohibits them from marrying, as it is with the *Lamas* of *Tibet*, from which country their religion was originally brought; but in *Népál* they do not obſerve this rule, except at their diſcretion; they have large monaſteries, in which every one has a ſeparate apartment or place of abode; they obſerve alſo particular feſtivals, the principal of which is called *Yátrà* in their language, and continues a month or longer according to the pleaſure of the king. The ceremony conſiſts in drawing an idol, which at *Lelit Pattan* is called BAGHERO*, in a large and richly ornamented car, covered with gilt

* I ſuppoſe the name of *Bhagavat* or *Criſhna*; but *Bhárga* is *Mahadéva*, and *Bajri* or *Vajri* means the *Thunderer*.

copper:

copper: round about the idol ſtand the king and the principal *Baryeſus*; and in this manner the vehicle is almoſt every day drawn through ſome one of the ſtreets of the city by the inhabitants, who run about beating and playing upon every kind of inſtrument their country affords, which make an inconceivable noiſe.

The other religion, the more common of the two, is that of the *Bráhmens*, and is the ſame as is followed in *Hinduſtàn*, with the difference that in the latter country the *Hindus* being mixed with the *Mohammedans*, their religion alſo abounds with many prejudices, and is not ſtrictly obſerved, whereas in *Népál*, where there are no *Muſelmans* (except one *Caſhmirian* merchant) the *Hindu* religion is practiſed in its greateſt purity: every day of the month they claſs under its proper name, when certain ſacrifices are to be performed, and certain prayers offered up in their temples: the places of worſhip are more in number in their towns than, I believe, are to be found in the moſt populous and moſt flouriſhing cities of *Chriſtendom*; many of them are magnificient according to their ideas of architecture, and conſtructed at a very conſiderable expence; ſome of them have four or five ſquare cupolas, and in ſome of the temples two or three of the extreme cupolas, as well as the doors and windows of them, are decorated with gilt copper.

In the city of *Lelit Pattan* the temple of BAGHERO was contiguous to my habitation, and was more valuable, on account of the gold, ſilver and jewels it contained, than even the houſe of the king: beſides the large temples there are alſo many ſmall ones, which have ſtairs, by which a ſingle perſon may aſcend, on the outſide all around them; and ſome of thoſe ſmall temples have four ſides, others ſix, with ſmall ſtone or marble pillars poliſhed very ſmooth, with two or three pyramidal ſtories, and all their ornaments well gilt, and neatly worked according to their ideas of taſte: and I think, that, if *Europeans* ſhould ever go into *Népál*, they might take ſome models from thoſe little temples, eſpecially from the two which are in the great court of *Lelit Pattan*, before the royal palace: on the outſide of ſome of their temples there are alſo great ſquare pillars or ſingle ſtones from twenty to thirty feet high, upon which they place their idols ſuperbly gilt. The greateſt number of their temples have a good ſtone ſtaircaſe in the middle of the four ſquares, and, at the end of each flight of ſtairs, there are lines cut out of ſtone on both ſides: around about their temples there are alſo bells, which the people ring on particular occaſions; and when they are at prayers, many cupolas are alſo quite filled with little bells hanging with cords in the inſide about the diſtance of a foot from each other, which make a great noiſe on the quarter where the wind conveys the ſound.

There

There are not only ſuperb temples in their great cities but alſo within their caſtles.

To the eaſtward of *Cat'hmándú* at the diſtance of about two or three miles there is a place called *Tolu,* by which there flows a ſmall river, the water of which is eſteemed holy according to their ſuperſtitious ideas, and thither they carry people of high rank, when they are thought to be at the point of death: at this place there is a temple, which is not inferiour to the beſt and richeſt in any of the capital cities. They alſo have it on tradition, that, at two or three places in *Népál*, valuable treaſures are concealed under ground: one of thoſe places they believe is *Tolu*, but no one is permitted to make uſe of them except the king, and that only in caſes of neceſſity. Thoſe treaſures, they ſay, have been accumulated in this manner: when any temple had become very rich from the offerings of the people, it was deſtroyed, and deep vaults dug under ground one above another, in which the gold, ſilver, gilt copper, jewels, and every thing of value were depoſited. When I was in *Népál*, GAINPREJAS, king of *Cat'hmándú*, being in the utmoſt diſtreſs for money to pay his troops, in order to ſupport himſelf againſt PRIT'HWI'NA'RA'YAN, ordered ſearch to be made for the treaſures of *Tolu*; and, having dug to a conſiderable depth under ground, they came to the firſt vault, from which his people took to the value of a lac of rupees in gilt copper, with which GAINPREJAS paid his troops, excluſive of a number of ſmall figures in gold or gilt copper, which the people who had made the ſearch had privately carried off: and this I know very well; becauſe one evening as I was walking in the country alone, a poor man, whom I met on the road, made me an offer of a figure of an idol in gold or copper gilt, which might be five or ſix ſicca weight, and which he cautiouſly preſerved under his arm, but I declined accepting it. The people of GAINPREJAS had not completely emptied the firſt vault, when the army of PRIT'HWI'NA'RA'YAN arrived at *Tolu*, poſſeſſed themſelves of the place where the treaſure was depoſited, and cloſed the door of the vault, having firſt replaced all the copper there had been on the outſide.

To the weſtward alſo of the great city of *Lelit Pattan* at the diſtance of only three miles, is a caſtle called *Banga,* in which there is a magnificent temple: no one of the miſſionaries ever entered into this caſtle, becauſe the people who have the care of it, have ſuch a ſcrupulous veneration for this temple, that no perſon is permitted to enter it with ſhoes on; and the miſſionaries, unwilling to ſhew ſuch reſpect to their falſe deities, never entered it. But when I was at *Népál*, this caſtle

 being

being in the poſſeſſion of the people of *Górc'há*, the commandant of the caſtle and of the two forts which border on the road, being a friend of the miſſionaries, gave me an invitation to his houſe, as he had occaſion for a little phyſick for himſelf and ſome of his people: I then, under the protection of the commandant, entered the caſtle ſeveral times, and the people durſt not oblige me to take off my ſhoes. One day, when I was at the commandant's houſe, he had occaſion to go into the varanda, which is at the bottom of the great court facing the temple, where all the chiefs dependent upon his orders were aſſembled, and where alſo was collected the wealth of the temple; and, wiſhing to ſpeak to me before I went away, he called me into the varanda. From this incident I obtained a ſight of the temple, and then paſſed by the great court which was in front: it is entirely marble almoſt blue, but interſperſed with large flowers of bronze well diſpoſed to form the pavement of the great court yard, the magnificence of which aſtoniſhed me, and I do not believe there is another equal to it in *Europe*.

Beſides the magnificence of the temples, which their cities and towns contain, there are many other rarities. At *Cat'hmándú* on one ſide of the royal garden there is a large fountain, in which is one of their idols called *Nárdyan*. This idol is of blue ſtone, crowned and ſleeping on a mattreſs alſo of the ſame kind of ſtone, and the idol and the mattreſs appear as floating upon the water. This ſtone machine is very large: and I believe it to be eighteen or twenty feet long and broad in proportion, but well worked and in good repair.

In a wall of the royal palace of *Cat'hmándú*, which is built upon the court before the palace, there is a great ſtone of a ſingle piece, which is about fifteen feet long, and four or five feet thick; on the top of this great ſtone, there are four ſquare holes at equal diſtances from each other: in the inſide of the wall they pour water into the holes, and in the court ſide, each hole having a cloſed canal, every perſon may draw water to drink: at the foot of the ſtone is a large ladder, by which people aſcend to drink; but the curioſity of the ſtone conſiſts in its being quite covered with characters of different languages cut upon it. Some lines contain the characters of the language of the country; others the characters of *Tibet*; others *Perſian*; others *Greek*, beſides ſeveral others of different nations; and in the middle there is a line of *Roman* characters; which appears in this form AVTOMNEW INTER LHIVERT; but none of the inhabitants have any knowledge how they came there, nor do they know whether or not any *European* had ever been in *Népál* before

before the miſſionaries, who arrived there only the beginning of the preſent century. They are manifeſtly two *French* names of ſeaſons, with an Engliſh word between them.

There is alſo to the northward of the city of *Cat'hmándú* a hill called *Simbi*, upon which are ſome tombs of the *Lamas* of *Tibet*, and other people of high rank of the ſame nation: the monuments are conſtructed after various forms; two or three of them are pyramidal, very high and well ornamented; ſo that they have a very good appearance, and may be ſeen at a conſiderable diſtance; round theſe monuments are remarkable ſtones covered with characters, which probably are the inſcriptions of ſome of the inhabitants of *Tibet*, whoſe bones were interred there. The natives of *Népál* not only look upon the hill as ſacred, but imagine it is protected by their idols! and from this erroneous ſuppoſition, never thought of ſtationing troops there for the defence of it, although it be a poſt of great importance, and only at a ſhort mile's diſtance from the city: but during the time of hoſtilities a party of PRIT'HWI'NA'RA'YAN's troops being purſued by thoſe of GAINPREJAS, the former, to ſave themſelves, fled to this hill, and, apprehending no danger from its guardian idols, they poſſeſſed themſelves of it and erected a fortification (in their own ſtyle) to defend themſelves: in digging the ditches round the fort, which were adjoining to the tombs, they found conſiderable pieces of gold, with a quantity of which metal the corpſes of the grandees of *Tibet* are always interred, and when the war was ended, I myſelf went to ſee the monuments upon the hills.

I believe that the kingdom of *Népál* is very ancient, becauſe it has always preſerved its peculiar language and independence; but the cauſe of its ruin is the diſſention which ſubſiſts among the three kings. After the death of their ſovereign the nobles of *Lelit Pattan* nominated for their king GAINPREJAS, a man poſſeſſed of the greateſt influence in *Népál*; but ſome years afterwards they removed him from his government, and conferred it upon the king of *Bh'atgán*; but he alſo a ſhort time afterwards was depoſed; and, after having put to death another king who ſucceeded him, they made an offer of the government to PRIT'HWI'NA'RA'YAN, who had already commenced war. PRIT'HWI'NA'RA'YAN deputed one of his brothers, by name DELMERDEN SA'H, to govern the kingdom of *Lelit Pattan*, and he was in the actual government of it, when I arrived at *Népál*; but the nobles perceiving that PRIT'HWI'NA'RA'YAN ſtill continued to interrupt the tranquillity of the kingdom, they diſclaimed all ſubjection to him, and acknowledged for their ſovereign DELMERDEN SA'H, who continued the war againſt his brother PRIT'HWI'-

NA'RA'YAN:

NA'RA'YAN: but ſome years afterwards, they even depoſed DELMERDEN SA'H, and elected in his room a poor man of *Lelit Pattan*, who was of royal origin.

The king of *Bh'atgán*, in order to wage war with the other kings of *Népál*, had demanded aſſiſtance from PRIT'HWI'NA'RA'YAN: but ſeeing that PRIT'HWI NA'RA'YAN was poſſeſſing himſelf of the country, he was obliged to deſiſt, and to take meaſures for the defence of his own poſſeſſions, ſo that the king of *Górc'hà*, although he had been formerly a ſubject of GAINPREJAS, taking advantage of the diſſentions, which prevailed among the other kings of *Népál*, attached to his party many of the mountain chiefs, promiſing to keep them in poſſeſſion, and alſo to augment their authority and importance; and, if any of them were guilty of a breach of faith, he ſeized their country as he had done to the kings of *Marecajis*, although his relations.

The king of *Górc'hà* having already poſſeſſed himſelf of all the mountains which ſurround the plain of *Népál*, began to deſcend into the flat country, imagining he ſhould be able to carry on his operations with the ſame facility and ſucceſs, as had attended him on the hills; and, having drawn up his army before a town, containing about 8000 houſes, ſituate upon a hill called *Cirtipur*, about a league's diſtance from *Cat'hmándú*, employed his utmoſt endeavours to get poſſeſſion of it: the inhabitants of *Cirtipur* receiving no ſupport from the king of *Lelit Pattan*, to whom they were ſubject, applied for aſſiſtance to GAINPREJAS, who immediately marched with his whole army to their relief, gave battle to the army of the king of *Górc'hà*, and obtained a complete victory. A brother of the king of *Górc'hà* was killed on the field of battle; and the king himſelf, by the aſſiſtance of good bearers, narrowly eſcaped with his life by fleeing into the mountains: after the action, the inhabitants of *Cirtipur* demanded GAINPREJAS for their king, and the nobles of the town went to confer with him on the buſineſs, but, being all aſſembled in the ſame apartment with the king, they were all ſurprized and ſeized by his people. After the ſeizure of thoſe perſons, GAINPREJAS, perhaps to revenge himſelf of theſe nobles, for having refuſed their concurrence to his nomination as king, privately cauſed ſome of them to be put to death; another, by name DANUVANTA, was led through the city in a woman's dreſs, along with ſeveral others, clothed in a ridiculous and whimſical manner, at the expence of the nobles of *Lelit Pattan*. They were then kept in cloſe confinement for a long time: at laſt, after making certain promiſes, and intereſting all the principal men of the country in their behalf, GAINPREJAS ſet them at liberty.

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The king of *Górc'hà*, despairing of his ability to get possession of the plain of *Népál* by strength, hoped to effect his purpose by causing a famine, and with this design, stationed troops at all the passes of the mountains to prevent any intercourse with *Népál*; and his orders were most rigorously obeyed, for every person who was found in the road, with only a little salt or cotton about him, was hung upon a tree; and he caused all the inhabitants of a neighbouring village to be put to death in a most cruel manner: even the women and children did not escape, for having supplied a little cotton to the inhabitants of *Népál*; and, when I arrived in that country at the beginning of 1769, it was a most horrid spectacle to behold so many people hanging on trees in the road. However the king of *Górc'hà* being also disappointed in his expectations of gaining his end by this project, fomented dissentions among the nobles of the three kingdoms of *Népál*, and attached to his party many of the principal ones by holding forth to them liberal and enticing promises, for which purpose he had about 2000 *Bráhmens* in his service. When he thought he had acquired a party sufficiently strong, he advanced a second time with his army to *Círtipur*, and laid siege to it on the north west quarter, that he might avoid exposing his army between the two cities of *Cat'hmándú*, and *Lelit Pattan*. After a siege of several months, the king of *Górc'hà* demanded the regency of the town of *Círtipur*, when the commandant of the town, seconded by the approbation of the inhabitants, dispatched to him by an arrow a very impertinent and exasperating answer. The king of *Górc'hà* was so much enraged at this mode of proceeding, that he gave immediate orders to all his troops to storm the town on every side: but the inhabitants bravely defended it, so that all the efforts of his men availed him nothing; and, when he saw that his army had failed of gaining the precipice, and that his brother named SURUPARATNA had fallen wounded by an arrow, he was obliged to raise the siege a second time and to retreat with his army from *Círtipur*. The brother of the king was afterwards cured of his wound by our father MICHAEL ANGELO, who is at present in *Bettia*.

After the action the king of *Górc'hà* sent his army against the king of *Lamji*, (one of the twenty-four kings who reign to the westward of *Népál*) bordering upon his own kingdom of *Górc'hà*: after many desperate engagements an accommodation took place, with the king of *Lamji*: and the king of *Górc'hà* collecting all his forces, sent them for the third time to besiege *Círtipur*, and the army on this expedition was commanded by his brother SURU'PARATNA. The inhabitants of *Círtipur* defended themselves with their usual bravery, and after a siege of several months,

months, the three kings of *Népál* aſſembled at *Cat'hmándú* to march a body of troops to the relief of *Cirtipur:* one day in the afternoon they attacked ſome of the *Tanas* of the *Górc'hians*, but did not ſucceed in forcing them, becauſe the king of *Górc'hà*'s party had been reinforced by many of the nobility, who to ruin GAINPREJAS were willing to ſacrifice their own lives. The inhabitants of *Cirtipur* having already ſuſtained ſix or ſeven months ſiege, a noble of *Lelit Pattan* called DANUVANTA fled to the *Górc'hà* party, and treacherouſly introduced their army into the town: the inhabitants might ſtill have defended themſelves, having many other fortreſſes in the upper parts of the town to retreat to; but the people at *Górc'hà* having publiſhed a general amneſty, the inhabitants greatly exhauſted by the fatigues of a long ſiege, ſurrendered themſelves priſoners upon the faith of that promiſe. In the mean time the men of *Górc'hà* ſeized all the gates and fortreſſes within the town; but two days afterwards PRIT'HWINA'RA'YAN, who was at *Navacúta* (a long day's journey diſtant) iſſued an order to SURU'PARATNA, his brother, to put to death ſome of the principal inhabitants of the town, and to cut off the noſes and lips of every one, even the infants, who were not found in the arms of their mothers; ordering at the ſame time all the noſes and lips, which had been cut off, to be preſerved, that he might aſcertain how many ſouls there were, and to change the name of the town into *Naſkatápur*, which ſignifies the *town of cut-noſes*, the order was carried into execution with every mark of horror and cruelty, none eſcaping, but thoſe who could play on wind inſtruments; although father MICHAEL ANGELO, who, without knowing that ſuch an inhuman ſcene was then exhibited, had gone to the houſe of SURU'PARATNA, interceded much in favour of the poor inhabitants: many of them put an end to their lives in deſpair; others came in great bodies to us in ſearch of medicines, and it was moſt ſhocking to ſee many living people with their teeth and noſes reſembling the ſkulls of the deceaſed.

After the capture of *Cirtipur*, PRIT'HWI'NA'RA'YAN diſpatched immediately his army to lay ſiege to the great city of *Lelit Pattan*. The *Górc'hians* ſurrounded half the city to the weſtward with their *Tanas*, and, my houſe being ſituated near the gate of that quarter, I was obliged to retire to *Cat'hmándú* to avoid being expoſed to the fire of the beſiegers. After many engagements between the inhabitants of the town of *Lelit Pattan*, and the men of *Górc'hà*, in which much blood was ſpilled on both ſides, the former were diſpoſed to ſurrender themſelves, from the fear of having their noſes cut off, like thoſe at *Cirtipur*, and alſo their right hands, a barbarity the *Górc'hians* had threatened them with, unleſs they would ſurrender within five days. One night all the *Górc'hians* quitted the ſiege of *Lelit Pattan* to purſue

purſue the *Engliſh* army, which, under the command of Captain KINLOCH, had already taken *Sidúli*, an important fort at the foot of the *Népál* hills, which border upon the kingdom of *Tirhút:* but Captain KINLOCH not being able to penetrate the hills, either on the *Sidúli* quarter or by the paſs at *Hareapur*, in the kingdom of *Macwanpur*, the army of *Górc'hà* returned to *Népál* to direct their operations againſt the city of *Cat'hmándú*, where GAINPREJAS was, who had applied for ſuccour to the *Engliſh*. During the ſiege of *Cat'hmándú* the *Bráhmens* of *Górc'hà* came almoſt every night into the city, to engage the chiefs of the people on the part of their king, and the more effectually to impoſe upon poor GAINPREJAS, many of the principal *Bráhmens* went to his houſe, and told him to perſevere with confidence, that the chiefs of the *Górc'hà* army were attached to his cauſe, and that even they themſelves would deliver up their king PRIT'HWINA'RA'YAN to his hands. Having by theſe artifices procured an opportunity of detaching from his party all his principal ſubjects, tempting them with liberal promiſes according to their cuſtom, one night the men of *Górc'hà* entered the city without oppoſition, and the wretched GAINPREJAS, perceiving he was betrayed, had ſcarce time to eſcape with about three hundred of his beſt and moſt faithful *Hinduſtáni* troops towards *Lelit Pattan*, which place however he reached the ſame night.

The king of *Górc'hà* having made himſelf maſter of *Cat'hmándú* in the year 1768, perſiſted in the attempt of poſſeſſing himſelf alſo of the city of *Lelit Pattan*, promiſing all the nobles, that he would ſuffer them to remain in the poſſeſſion of their property, that he would even augment it; and, becauſe the nobles of *Lelit Pattan* placed a reliance on the faith of his promiſes, he ſent his domeſtick prieſt to make this proteſtation; that, if he failed to acquit himſelf of his promiſe, he ſhould draw curſes upon himſelf and his family even to the fifth, paſt and ſucceeding generation, ſo that the unhappy GAINPREJAS and the king of *Lelit Pattan*, ſeeing that the nobility were diſpoſed to render themſelves ſubject to the king of *Górc'hà*, withdrew themſelves with their people to the king of *B'hatgàn:* when the city of *Lelit Pattan* became ſubject to the king of *Górc'hà*, he continued for ſome time to treat the nobility with great attention, and propoſed to appoint a viceroy of the city from among them. Two or three months afterwards, having appointed the day for making his formal entrance into the city of *Lelit Pattan*, he made uſe of innumerable ſtratagems to get into his poſſeſſion the perſons of the nobility, and in the end ſucceeded; he had prevailed upon them to permit their ſons to remain at court as companions of his ſon; he had diſpatched a noble of each houſe to *Navacút*, or *New Fort*, pretending that the apprehenſions he entertained of them had prevented his

his making a public entrance into the city; and the remaining nobles were ſeized at the river without the town, where they went to meet him agreeably to a prior engagement. Afterwards he entered the city, made a viſit to the temple of BAGHERO, adjoining to our habitation, and paſſing in triumph through the city amidſt immenſe numbers of ſoldiers, who compoſed his train, entered the royal palace, which had been prepared for his reception; in the mean time parties of his ſoldiers broke open the houſes of the nobility, ſeized all their effects, and threw the inhabitants of the city into the utmoſt conſternation: after having cauſed all the nobles who were in his power to be put to death, or rather their bodies to be mangled in a horrid manner, he departed with a deſign of beſieging *B'hatgán*, and we obtained permiſſion, through the intereſt of his ſon, to retire with all the *Chriſtians* into the poſſeſſions of the *Engliſh*.

At the commencement of the year 1769, the king of *Górc'hà* acquired poſſeſſion of the city of *B'hatgán*, by the ſame expedients to which he owed his former ſucceſſes, and on his entrance with his troops into the city, GAINPREJAS, ſeeing he had no reſource left to ſave himſelf, ran courageouſly with his attendants towards the king of *Górc'hà*, and, at a ſmall diſtance from his palanquin, received a wound in his foot, which a few days afterwards occaſioned his death. The king of *Lelit Pattan* was confined in irons till his death, and the king of *B'hatgán*, being very far advanced in years, obtained leave to go and die at *Banares*. A ſhort time afterwards the mother of GAINPRÉJAS alſo procured the ſame indulgence, having from old age already loſt her eye-ſight; but before her departure they took from her a necklace of jewels; as ſhe herſelf told me, when ſhe arrived at *Patna* with the widow of her grand-ſon: and I could not refrain from tears, when I beheld the miſery and diſgrace of this blind and unhappy queen.

The king of *Górc'hà*, having thus in the ſpace of four years effected the conqueſt of *Népál*, made himſelf maſter alſo of the country of the *Cirátas* to the eaſt of it, and of other kingdoms, as far as the borders of *Cóch Bihàr*: after his deceaſe, his eldeſt ſon PRATA'P SINH held the government of the whole country; but ſcarcely two years after on PRATA'P SINH's death, a younger brother, by name BAHA'DAR SA'H, who reſided then at *Bettía* with his uncle DELMERDEN SA'H, was invited to accept of the government, and the beginning of his government was marked with many maſſacres. The royal family is in the greateſt confuſion, becauſe the queen lays claim to the government in the name of her ſon, whom ſhe had by PRATA'P SINH; and perhaps the oath violated by PRIT'HWINA'RA'YAN will in the progreſs of time have its effect. Such have been the ſucceſſors of the kingdoms of *Népál*, of which PRITWINA'RA'YAN had thus acquired poſſeſſion.

ON

XVIII.

ON THE CURE OF PERSONS BITTEN BY SNAKES.

By JOHN WILLIAMS, *Efq.*

THE following ftatement of facts relative to the cure of perfons bitten by fnakes, felected from a number of cafes, which have come within my own knowledge, require no prefatory introduction; as it points out the means of obtaining the greateft felf-gratification the human mind is capable of experiencing; that of the prefervation of the life of a fellow-creature, and fnatching him from the jaws of death, by a method which every perfon is capable of availing himfelf of. Eau de Luce, I learn from many communications which I have received from different parts of the country, anfwers as well as the pure Cauftick Alkali Spirit; and though, from its having fome effential oils in its compofition, it may not be fo powerful, yet, as it muft be given with water, it only requires to encreafe the dofe in proportion; and, fo long as it retains its milky white colour, it is fufficiently efficacious.

From the effect of a ligature applied between the part bitten and the heart, it is evident that the poifon diffufes itfelf over the body by the returning venous blood; deftroying the irritability, and rendering the fyftem paralytick. It is therefore probable that the Volatile Cauftick Alkali in refifting the difeafe of the poifon, does not act fo much as a fpecifick in deftroying its quality, as by counteracting the effect on the fyftem, by ftimulating the fibres, and preferving that irritability which it tends to deftroy.

CASE I.

In the month of *Auguft*, 1780, a fervant of mine was bitten in the heel, as he fuppofed, by a fnake; and in a few minutes was in great agony, with convulfions about the throat and jaws, and continual grinding of teeth: having a wifh to try the effects of Volatile Alkali in fuch cafes, I gave him about forty drops of Eau de Luce in water, and applied fome of it to the part bitten; the dofe was repeated every eight or ten minutes, till a fmall phial-full was expended: it was near two hours before it could be faid he was out of danger. A numbnefs and pricking fenfation was perceived extending itfelf up to the knee, where a ligature was applied fo tight as to ftop the returning venous blood, which feemingly checked the progrefs of the deleterious poifon. The foot and leg, up to where the ligature was made, were

 ftiff

ftiff and painful for feveral days; and, which appeared very fingular, were covered with a branny fcale.

The above was the firft cafe in which I tried the effects of the Volatile Alkali, and, apprehending that the effential oils in the compofition of Eau de Luce, though made of the ftrong Cauftick Volatile Spirit, would confiderably diminifh its powers. *I* was induced, the next opportunity that offered, to try the effects of pure Volatile Cauftick Alkali Spirit, and accordingly prepared fome from Quicklime and the Sal Ammoniack of this country.

CASE II.

In *July*, 1782, a woman of the *Bráhmen* caft, who lived in my neighbourhood at *Chunár*, was bitten by a *Cobra de Capello* between the thumb and fore-finger of her right hand: prayers and fuperftitious incantations were practifed by the *Bráhmens* about her till fhe became fpeechlefs and convulfed, with locked jaws, and a profufe difcharge of faliva running from her mouth. On being informed of the accident, I immediately fent a fervant with a bottle of the Volatile Cauftick Alkali Spirit, of which he poured about a tea-fpoon-full, mixed with water, down her throat, and applied fome of it to the part bitten: the dofe was repeated a few minutes after, when fhe was evidently better, and in about half an hour was perfectly recovered.

This accident happened in a fmall hut, where I faw the fnake, which was a middle-fized *Cobra de Capello*: the *Bráhmens* would not allow it to be killed. In the above cafe, no other means whatever were ufed for the recovery of the patient than are here recited.

CASE III.

A woman-fervant in the family of a gentleman at *Benares* was bitten in the foot by a *Cobra de Capello*: the gentleman immediately applied to me for fome of the Volatile Cauftick Alkali, which I fortunately had by me. I gave her about fixty drops in water, and alfo applied fome of it to the part bitten: in about feven or eight minutes after, fhe was quite recovered. In the above cafe, I was not witnefs to the deleterious effect of the poifon on the patient; but faw the fnake after it was killed.

CASE IV.

In *July*, 1784, the wife of a fervant of mine was bitten by a *Cobra de Capello* on the out-fide of the little toe of her right foot. In a few minutes fhe became con-

vulfed,

vulfed, particularly about the jaws and throat, with a continued gnafhing of the teeth. She at firft complained of a numbnefs extending from the wound upwards, but no ligature was applied to the limb. About fixty drops of the Volatile Cauftick Spirit were given to her in water, by forcing open her mouth, which was ftrongly convulfed: in about feven minutes the dofe was repeated, when the convulfions left her; and in three more fhe became fenfible, and fpoke to thofe who attended her. A few drops of the fpirit had alfo been applied to the wound. The fnake was killed and brought to me, which proved to be a *Cobra de Capello.*

CASE V.

As it is generally believed, that the venom of fnakes is more malignant during hot dry weather, than at any other feafon, the following cafe, which occurred in the month of *July*, 1788, when the weather was extremely hot, no rain, excepting a flight fhower, having fallen for many months, may not be unworthy notice.

A fervant belonging to an Officer at *Juanpoor,* was bitten by a fnake on the leg, about two inches above the outer ankle. As the accident happened in the evening, he could not fee what fpecies of fnake it was: he immediately tied a ligature above the part bitten, but was in a few minutes in fuch exquifite torture from pain, which extended up his body and to his head, that he foon became dizzy and fenfelefs. On being informed of the accident, I fent my fervant with a phial of the Volatile Cauftick Alkali, who found him, when he arrived, quite torpid, with the faliva running out of his mouth, and his jaws fo faft locked, as to render it neceffary to ufe an inftrument, to open them and adminifter the medicine. About forty drops of the Volatile Cauftick Spirit were given to him in water, and applied to the wound; and the fame dofe repeated a few minutes after. In about half an hour he was perfectly recovered. On examining the part bitten, I could difcover the marks of three fangs; two on one fide, and one on the other; and, from the diftance they were afunder, I fhould judge it a large fnake. More than ten minutes did not appear to have elapfed from the time of his being bitten, till the medicine was adminiftered. The wounds healed immediately, and he was able to attend to his duty the next day. Though the fpecies of fnake was not afcertained, yet I judge from the flow of faliva from the mouth, convulfive fpafms of the jaws and throat, as well as from the marks of three fangs, that it muft have been a *Cobra de Capello*; and, though I have met with five and fix fangs of different fizes in fnakes of that fpecies,

I never

I never obſerved the marks of more than two having been applied in biting in any other caſe, which came within my knowledge.

CASE VI.

In *September*, 1786, a ſervant belonging to Captain S——, who was then at *Benares*, was bitten in the leg by a large *Cobra de Capello*: he ſaw the ſnake coming towards him, with his neck ſpread out in a very tremendous manner, and endeavoured to avoid him; but, before he could get out of his way, the ſnake ſeized him by the leg, and ſecured his hold for ſome time, as if he had not been able to extricate his teeth. Application was immediately made to his maſter for a remedy, who ſent to conſult me; but, before I arrived, had given him a quantity of ſweet oil, which he drank. So ſoon as I ſaw him, I directed the uſual doſe of Volatile Cauſtick Alkali to be given, which fortunately brought away the oil from his ſtomach, or it is probable that the ſtimulating effect of the Volatile Spirit would have been ſo much blunted by it, as to have become inefficacious: a ſecond doſe was immediately adminiſtered, and ſome time after a third. The man recovered in the courſe of a few hours. As oil is frequently adminiſtered as a remedy in the bite of ſnakes, I think it neceſſary to caution againſt the uſe of it with the Volatile Alkali, as it blunts the ſtimulating quality of the ſpirit, and renders it uſeleſs.

Of the numerous ſpecies of ſnakes which I have met with, not above ſix were provided with poiſonous fangs; though I have examined many which have been conſidered by the natives as dangerous, without being able to diſcover any thing noxious in them.

The following is an inſtance of the deleterious effect of the bite of a ſnake called by the natives *Krait*, a ſpecies of the *Boa*, which I have frequently met with in this part of the country.

CASE VII.

On the 16th *September*, 1788, a man was brought to me who had been bitten by a ſnake, with the marks of two fangs on two of his toes; he was ſaid to have been bitten above an hour before I ſaw him: he was perfectly ſenſible, but complained of great pain in the parts bitten, with an univerſal languor. I immediately gave him thirty drops of the Volatile Cauſtick Alkali Spirit in water, and applied ſome of it to the wounds: in a few minutes he became eaſier, and in about half an hour was carried away by his friends, with perfect confidence in his recovery, without having taken

taken a ſecond doſe of the medicine, which indeed did not appear to have been neceſſary; but, whether from the effect of the bite of the ſnake, or the motion of the dooly on which he was carried, I know not; but he became ſick at the ſtomach, threw up the medicine, and died in about a quarter of an hour after. The man ſaid, that the ſnake came up to him while he was ſitting on the ground; and that he put him away with his hand once, but that he turned about and bit him as deſcribed: the ſnake was brought to me which I examined; it was about two feet and a half long, of a lightiſh brown colour on the back, a white belly, and annulated from end to end, which 208 abdominal, and forty-ſix tail ſcuta. I have met with ſeveral of them from thirteen inches to near three feet in length: it had two poiſonous fangs in the upper jaw, which lay naked, with their points without the upper lip. It does not ſpread its neck like the *Cobra de Capello,* when enraged; but is very active and quick in its motion.

I have ſeen inſtances of perſons bitten by ſnakes, who have been ſo long without aſſiſtance, that, when they have been brought to me, they have not been able to ſwallow, from convulſions of the throat and fauces, which is, I obſerve, a conſtant ſymptom of the bite of the *Cobra de Capello:* and indeed I have had many perſons brought to me who had been dead ſome time; but never knew an inſtance of the Volatile Cauſtick Alkali failing in its effect, where the patient has been able to ſwallow it.

XIX.

ON SOME ROMAN COINS FOUND AT NELORE.

To the PRESIDENT *of the* ASIATICK SOCIETY.

SIR,

I HAVE the honour to preſent you with an extract of a letter from Mr. ALEXANDER DAVIDSON, late Governor of *Madras,* giving an account of ſome *Roman Coins* and *Medals* lately found near *Nelòr,* together with a drawing of them copied from one tranſmitted by Mr. DAVIDSON; which, I imagine, may be acceptable to the *Aſiatick* Society.

I have the honour to be,

Sir,

Your moſt obedient humble ſervant,

S. DAVIS.

Calcutta, March 20, 1788.

EXTRACT OF A LETTER FROM ALEXANDER DAVIDSON, ESQ.

DATED MADRAS, JULY 12, 1787.

A PEASANT near *Nelòr*, about 100 miles north-weſt of *Madras*, was ploughing on the ſide of a ſtony craggy hill: his plough was obſtructed by ſome brickwork: he dug, and diſcovered the remains of a ſmall *Hindu* temple, under which a little pot was found with *Roman* Coins and Medals of the ſecond century.

He ſold them as old gold; and many no doubt were melted, but the *Nawáb* AMI'RUL UMARA' recovered upwards of thirty of them. This happened while I was governor; and I had the choice of two out of the whole. I choſe an ADRIAN and a FAUSTINA.

Some of the TRAJANS were in good preſervation. Many of the Coins could not have been in circulation: they were all of the pureſt gold, and many of them as freſh and beautiful as if they had come from the Mint but yeſterday: ſome were much defaced and perforated, and had probably been worn as ornaments on the arm and others pending from the neck.

I ſend you drawings of my two Coins, and have no Objection to your publiſhing an account of them in the Tranſactions of the *Aſiatick* Society. I received my information reſpecting them from the young *Nawáb*, and if my name be neceſſary to authenticate the facts I have related, you have my permiſſion to uſe it.

XX.

ON TWO HINDU FESTIVALS, AND THE INDIAN SPHINX.

By the late COLONEL PEARSE, *May* 12, 1785.

I BEG leave to point out to the Society, that the *Sunday* before laſt was the Feſtival of BHAVA'NI', which is annually celebrated by the *Gópas* and all other *Hindus*, who keep horned cattle for uſe or profit; on this feaſt they viſit gardens, erect a pole in the fields, and adorn it with pendants and garlands. The *Sunday* before laſt was our *firſt* of *May*, on which the ſame rites are performed by the ſame claſs of people in *England*, where it is well known to be a relique of ancient ſuperſtition in that country: it ſhould ſeem, therefore, that the religion of the Eaſt and the old religion of





To face p. 323.


DIVA·AUG FAVSTINA
AUR
PIE TASAVG
HADRIANVS AVGVSTVS
AUR
C O S



of *Britain* had a ſtrong affinity. BHAVA'NI' has another feſtival; but that is not kept by any one ſet of *Hindus* in particular, and this is appropriated to one claſs of people; this is conſtantly held on the *ninth* of *Baiſác'h*; which does not always fall on our *firſt* of *May*, as it did this year. Thoſe members of the Society, who are acquainted with the rules which regulate the feſtivals, may be able to give better information concerning this point: I only mean to point out the reſemblance of the rites performed here and in *England*, but muſt leave abler hands to inveſtigate the matter further, if it ſhould be thought deſerving of the trouble. I find, that the feſtival, which I have mentioned, is one of the moſt ancient among the *Hindus*.

II. During the *Húli*, when mirth and feſtivity reign among *Hindus* of every claſs, one ſubject of diverſion is to ſend people on errands and expeditions, that are to end in diſappointment, and raiſe a laugh at the expence of the perſon ſent. The *Húli* is always in *March*, and the laſt day is the greateſt holiday: all the *Hindus*, who are on that day at *Jagannát'h*, are entitled to certain diſtinctions, which they hold to be of ſuch importance, that I found it expedient to ſtay there till the end of the feſtival; and I am of opinion, and ſo are the reſt of the officers, that I ſaved above five hundred men by the delay. The origin of the *Húli* ſeems loſt in antiquity; and I have not been able to pick up the ſmalleſt account of it.

If the rites of MAYDAY ſhew any affinity between the religion of *England* in times paſt and that of the *Hindus* in theſe times, may not the cuſtom of making *April-fools*, on the firſt of that month, indicate ſome traces of the *Húli*? I have never yet heard any account of the origin of the *Engliſh* cuſtom; but it is unqueſtionably very ancient, and is ſtill kept up even in great towns, though leſs in them than in the country: with us it is chiefly confined to the lower claſſes of people; but in *India* high and low join in it; and the late SHUJA'UL DAULAH, I am told, was very fond of making *Húli*-fools, though he was a *Muſelman* of the higheſt rank. They carry it here ſo far, as to ſend letters making appointments, in the names of perſons, who, it is known, muſt be abſent from their houſe at the time fixed on; and the laugh is always in proportion to the trouble given.

III. At *Jagannát'h* I found the *Sphinx* of the *Egyptians*, and preſent the Society with a drawing of it. MURA'RI *Pandit*, who was deputy *Faujdàr* of *Balaſór*, attended my detachment on the part of the *Mahrátas:* he is now the principal *Faujdàr*, and is much of the gentleman, a man of learning, and very intelligent. From him I learned, that the *Sphinx*, here called *Singh*, is to appear at the end of the

the world, and, as ſoon as he is born, will prey on an elephant: he is, therefore, figured ſeizing an elephant in his claws, and the elephant is made ſmall, to ſhow that the *Singh*, even a moment after his birth, will be very large in proportion to it.

When I told MURA'RI, that the *Egyptians* worſhipped a bull and choſe the God by a black mark on his tongue, and that they adored birds and trees, he immediately exclaimed " their religion then was the ſame with ours; for we alſo choſe our " *ſacred bulls* by the *ſame marks*; we reverence the *hanſa*, the *garura*, and other " birds; we reſpect the *pippal* and the *vata* among trees, and the *tulasì* among " ſhrubs; but as for onions (which I had mentioned), they are eaten by low men, " and are fitter to be eaten than worſhipped."

REMARK BY THE PRESIDENT.

Without preſuming to queſtion the authority of MURA'RI *Pandit*, I can only ſay that ſeveral *Bráhmans*, now in *Bengal*, have ſeen the figure at *Jagannát'h*, where one of the gates is called *Sinhadwár*; and they aſſure me, that they always conſidered it as a mere repreſentation of a *Lion* ſeizing a young elephant; nor do they know, they ſay, any ſenſe for the word *Sinha*, but a *Lion*, ſuch as Mr. HASTINGS kept near his garden. The *Húli*, called *Hóláca* in the *Védas*, and *P'halgútſava* in common *Sanſcrit* books, is the feſtival of the vernal ſeaſon, or *Naurúz* of the *Perſians*.

XXI.

A SHORT DESCRIPTION OF CARNICOBAR, BY MR. G. HAMILTON.

Communicated by Mr. ZOFFANY.

THE iſland, of which I propoſe to give a ſuccinct account, is the northernmoſt of that cluſter in the *Bay* of *Bengal*, which goes by the name of the *Nicobars*. It is low, of a round figure, about forty miles in circumference, and appears at a diſtance as if entirely covered with trees: however, there are ſeveral well cleared and delightful ſpots upon it. The ſoil is a black kind of clay, and marſhy. It produces in great abundance, and with little care, moſt of the tropical fruits, ſuch as pine-apples, plantains, papayas, cocoa-nuts, and areca-nuts; alſo excellent yams, and

and a root called *cachu.* The only four-footed animals upon the iſland are hogs, dogs, large rats, and an animal of the lizard kind, but large, called by the natives *tolonqui*; theſe frequently carry off fowls and chickens. The only kind of poultry are hens, and thoſe not in great plenty. There are abundance of ſnakes of many different kinds, and the inhabitants frequently die of their bites. The timber upon the iſland is of many ſorts, in great plenty, and ſome of it remarkably large, affording excellent materials for building or repairing ſhips.

The natives are low in ſtature, but very well made, and ſurprizingly active and ſtrong; they are copper-coloured, and their features have a caſt of the *Malay*; quite the reverſe of elegant. The women in particular are extremely ugly. The men cut their hair ſhort, and the women have their heads ſhaved quite bare, and wear no covering but a ſhort petticoat, made of a ſort of ruſh or dry graſs, which reaches half way down the thigh. This graſs is not interwoven, but hangs round the perſon ſomething like the thatching of a houſe. Such of them as have received preſents of cloth-petticoats from the ſhips, commonly tie them round immediately under the arms. The men wear nothing but a narrow ſtrip of cloth about the middle, in which they wrap up their privities ſo tight that there hardly is any appearance of them. The ears of both ſexes are pierced when young, and by ſqueezing into the holes large plugs of wood, or hanging heavy weights of ſhells, they contrive to render them wide, and diſagreeable to look at. They are naturally diſpoſed to be good-humoured and gay, and are very fond of ſitting at table with *Europeans*, where they eat every thing that is ſet before them; and they eat moſt enormouſly. They do not care much for wine, but will drink bumpers of arrack as long as they can ſee. A great part of their time is ſpent in feaſting and dancing. When a feaſt is held at any village, every one that chooſes goes uninvited, for they are utter ſtrangers to ceremony. At thoſe feaſts they eat immenſe quantities of pork, which is their favourite food. Their hogs are remarkably fat, being fed upon the cocoa-nut kernel and ſea-water: indeed all their domeſtic animals, fowls, dogs, &c. are fed upon the ſame. They have likewiſe plenty of ſmall ſea-fiſh, which they ſtrike very dextrouſly with lances, wading into the ſea about knee deep. They are ſure of killing a very ſmall fiſh at ten or twelve yards diſtance. They eat the pork almoſt raw, giving it only a haſty grill over a quick fire. They roaſt a fowl, by running a piece of wood through it, by way of ſpit, and holding it over a briſk fire, until the feathers are burnt off, when it is ready for eating, in their taſte. They never drink water; only cocoa-nut milk and a liquor called *ſoura*,

which oozes from the cocoa-nut tree after cutting off the young ſprouts or flowers. This they ſuffer to ferment before it is uſed, and then it is intoxicating, to which quality they add much by their method of drinking it, by ſucking it ſlowly through a *ſmall ſtraw*. After eating, the young men and women, who are fancifully *dreſt* with leaves, go to dancing, and the old people ſurround them ſmoaking *tobacco* and drinking *ſoura*. The dancers, while performing, ſing ſome of their tunes, which are far from wanting harmony, and to which they keep exact time. Of muſical inſtruments they have only one kind, and that the ſimpleſt. It is a hollow bamboo about 2½ feet long and three inches in diameter, along the outſide of which there is ſtretched from end to end a ſingle ſtring made of the threads of a ſplit cane, and the place under the ſtring is hollowed a little to prevent it from touching. This inſtrument is played upon in the ſame manner as a guitar. It is capable of producing but few notes; the performer however makes it ſpeak harmoniouſly, and generally accompanies it with the voice.

What they know of phyſick is ſmall and ſimple. I had once occaſion to ſee an operation in ſurgery performed on the toe of a young girl, who had been ſtung by a ſcorpion or centipee. The wound was attended with a conſiderable ſwelling, and the little patient ſeemed in great pain. One of the natives produced the under jaw of a ſmall fiſh, which was long, and planted with two rows of teeth as ſharp as needles: taking this in one hand, and a ſmall ſtick by way of hammer in the other, he ſtruck the teeth three or four times into the ſwelling, and made it bleed freely: the toe was then bound up with certain leaves, and next day the child was running about perfectly well.

Their houſes are generally built upon the beach in villages of fifteen or twenty houſes each; and each houſe contains a family of twenty perſons and upwards. Theſe habitations are raiſed upon wooden pillars about ten feet from the ground; they are round, and, having no windows, look like bee-hives, covered with thatch. The entry is through a trap-door below, where the family mount by a ladder, which is drawn up at night. This manner of building is intended to ſecure the houſes from being infeſted with ſnakes, and rats, and for that purpoſe the pillars are bound round with a ſmooth kind of leaf, which prevents animals from being able to mount; beſides which, each pillar has a broad round flat piece of wood near the top of it, the projecting of which effectually prevents the further progreſs of ſuch vermin as may have paſſed the leaf. The flooring is made with thin ſtrips of bamboos laid at ſuch diſtances from one another, as to leave free admiſſion for light

light and air, and the infide is neatly finifhed and decorated with fifhing lances, nets, &c.

The art of making cloth of any kind is quite unknown to the inhabitants of this ifland; what they have is got from the fhips that come to trade in cocoa-nuts. In exchange for their nuts (which are reckoned the fineft in this part of *India)* they will accept of but few articles; what they chiefly wifh for is cloth of different colours, hatchets and hanger blades, which they ufe in cutting down the nuts. Tobacco and arak they are very fond of, but expect thefe in prefents. They have no money of their own, nor will they allow any value to the coin of other countries, further than as they happen to fancy them for ornaments; the young women fometimes hanging ftrings of dollars about their necks. However they are good judges of gold and filver, and it is no eafy matter to impofe bafer metals upon them, as fuch.

They purchafe a much larger quantity of cloth, than is confumed upon their own ifland. This is intended for the *Choury* market. *Choury* is a fmall ifland to the fouthward of theirs, to which a large fleet of their boats fails every year about the month of *November*, to exchange cloth for *Canoes*; for they cannot make thefe themfelves. This voyage they perform by the help of the fun and ftars, for they know nothing of the compafs.

In their difpofition there are two remarkable qualities. One is their entire neglect of compliment and ceremony, and the other, their averfion to difhonefty. A *Carnicobarian* travelling to a diftant village upon bufinefs or amufement, paffes through many towns in his way without perhaps fpeaking to any one: if he is hungry or tired he goes up into the neareft houfe, and helps himfelf to what he wants, and fits till he is refted, without taking the fmalleft notice of any of the family, unlefs he has bufinefs or news to communicate. Theft or robbery is fo very rare amongft them, that a man going out of his houfe, never takes away his ladder, or fhuts his door, but leaves it open for any body to enter that pleafes, without the leaft apprehenfion of having any thing ftolen from him.

Their intercourfe with ftrangers is fo frequent, that they have acquired in general the barbarous *Portuguefe* fo common over *India*; their own language has a found quite different from moft others, their words being pronounced with a kind of ftop, or catch in the throat, at every fyllable. The few following words will ferve to fhew thofe who are acquainted with other *Indian* languages, whether there is any fimilitude between them.

A man

A man,	*Kegonia.*	To eat,	*Gnia.*
A woman,	*Kecanna.*	To drink,	*Okk.*
A child,	*Chu.*	Yams,	*T'owla.*
To laugh,	*Ayelaur.*	To weep,	*Poing.*
A canoe,	*App.*	A pine apple,	*Frung.*
A houfe,	*Albanum.*	To fleep,	*Loom loom.*
A fowl,	*Haydm.*	A dog,	*T'amam.*
A hog,	*Hown.*	Fire,	*T'amia.*
Fifh,	*Ka.*	Rain,	*Koomra.*

They have no notion of a God, but they believe firmly in the devil and worfhip him from fear. In every village there is a high pole erected with long ftrings of ground-rattans hanging from it, which, it is faid, has the virtue to keep him at a diftance. When they fee any figns of an approaching ftorm, they imagine that the devil intends them a vifit, upon which many fuperftitious ceremonies are performed. The people of every village march round their own boundaries, and fix up at different diftances fmall fticks fplit at the top, into which fplit they put a piece of cocoa-nut, a wifp of tobacco, and the leaf of a certain plant: whether this is meant as a peace-offering to the devil, or a fcarecrow to frighten him away, does not appear.

When a man dies, all his live ftock, cloth, hatchets, fifhing lances, and in fhort every moveable thing he poffeffed is buried with him, and his death is mourned by the whole village. In one view this is an excellent cuftom, feeing it prevents all difputes about the property of the deceafed amongft his relations. His wife muft conform to cuftom by having a joint cut off from one of her fingers; and, if fhe refufes this, fhe muft fubmit to have a deep notch cut in one of the pillars of her houfe.

I was once prefent at the funeral of an old woman. When we went into the houfe, which had belonged to the deceafed, we found it full of her female relations; fome of them were employed in wrapping up the corpfe in leaves and cloth, and others tearing to pieces all the cloth which had belonged to her. In another houfe hard by, the men of the village, with a great many others from the neighbouring towns, were fitting drinking *foura* and fmoaking tobacco. In the mean time two ftout young fellows were bufy digging a grave in the fand near the houfe. When the women had done with the corpfe, they fet up a moft hideous howl, upon which the people began to affemble round the grave, and four men went up into the houfe to bring down the body; in doing this they were much interrupted by a young

young man, ſon to the deceaſed, who endeavoured with all his might to prevent them, but finding it in vain, he clung round the body, and was carried to the grave along with it: there, after a violent ſtruggle, he was turned away and conducted back to the houſe. The corpſe being now put into the grave, and the laſhings, which bound the legs and arms, cut, all the live ſtock, which had been the property of the deceaſed, conſiſting of about half a dozen hogs, and as many fowls, was killed, and flung in above it; a man then approached with a bunch of leaves ſtuck upon the end of a pole, which he ſwept two or three times gently along the corpſe, and then the grave was filled up. During the ceremony, the women continued to make the moſt horrible vocal concert imaginable: the men ſaid nothing. A few days afterwards, a kind of monument was erected over the grave, with a pole upon it, to which long ſtrips of cloth of different colours were hung.

Polygamy is not known among them; and their puniſhment of adultery is not leſs ſevere than effectual. They cut, from the man's offending member, a piece of the foreſkin proportioned to the frequent commiſſion or enormity of the crime.

There ſeems to ſubſiſt among them a perfect equality. A few perſons, from their age, have a little more reſpect paid to them; but there is no appearance of authority one over another. Their ſociety ſeems bound rather by mutual obligations continually conferred and received; the ſimpleſt and beſt of all ties.

The inhabitants of the *Andamans* are ſaid to be *Cannibals*. The people of *Carnicobar* have a tradition among them, that ſeveral canoes came from *Andaman* many years ago, and that the crews were all armed, and committed great depredations, and killed ſeveral of the *Nicobarians*. It appears at firſt remarkable, that there ſhould be ſuch a wide difference between the manners of the inhabitants of iſlands ſo near to one another; the *Andamans* being ſavage *Cannibals*, and the others, the moſt harmleſs inoffenſive people poſſible. But it is accounted for by the following hiſtorical anecdote, which, I have been aſſured, is matter of fact. Shortly after the *Portugueſe* had diſcovered the paſſage to *India* round the *Cape of Good Hope*, one of their ſhips, on board of which were a number of *Mozambique* negroes, was loſt on the *Andaman* iſlands, which were till then uninhabited. The blacks remained in the iſland and ſettled it: the *Europeans* made a ſmall ſhallop in which they ſailed to *Pegu*. On the other hand, the *Nicobar* iſlands were peopled from the oppoſite main, and the coaſt of *Pegu*; in proof of which the *Nicobar* and *Pegu* languages are ſaid, by thoſe acquainted with the latter, to have much reſemblance.

XXII.

XXII.

THE DESIGN OF A TREATISE ON THE PLANTS OF INDIA. — *See the Works of Sir William Jones, Vol. II. p. 1.*

XXIII.

ON THE DISSECTION OF THE PANGOLIN.

In a Letter to GENERAL CARNAC *from* ADAM BURT, *Esq.*

Communicated by the GENERAL.

SIR,

IN compliance with your desire, I most willingly do myself the honour to present to you my observations and reflections on the dissection of one of those animals, of which we have a print, with a very short account, in the FIRST VOL. of the TRANSACTIONS of the ASIATIC SOCIETY. The animal, from which that likeness has been taken, was sent by Mr. LESLIE, from *Chitra*, to the president Sir WILLIAM JONES. It is distinguished in the TRANSACTIONS by a name, which I do not at present remember; but probably the animal is of the same genus with the *Manis*, as described in the former edition of the ENCYCLOPÆDIA BRITANNICA, or, perhaps, not different from the *Pangolin* of BUFFON.

The representation of this animal in the MEMOIRS of the ASIATIC SOCIETY, makes it unnecessary for me to enter into any general description of its external figure and appearance. There are on each foot five claws, of which the outer and inner are small when compared with the other three. There are no distinct toes; but each nail is moveable by a joint at its root. This creature is extremely inoffensive. It has *no teeth*; and its feet are unable to grasp. Hence it would appear, that nature, having furnished it with a coat of mail for its protection, has, with some regard to justice, denied it the powers of acting with hostility against its fellow-creatures. The nails are well adapted for digging in the ground; and the animal

animal is ſo dextrous in eluding its enemies by concealing itſelf in holes and among rocks that it is extremely difficult to procure one.

The upper jaw is covered with a croſs cartilaginous ridge, which though apparently not at all ſuited to any purpoſes of maſtication, may, by encreaſing the ſurface of the palate, extend the ſenſe of taſte. The œſophagus admitted my forefinger with eaſe. The tongue at the bottom of the mouth is nearly about the ſize of the little finger, from whence it tapers to a point. The animal at pleaſure protrudes this member a great way from the mouth. The tongue ariſes from the enſiform cartilage, and the contiguous muſcles of the belly, and paſſes in form of a round diſtinct muſcle from over the ſtomach, through the thorax, immediately under the ſternum; and interiour to the windpipe in the throat. When diſſected out, the tongue could be eaſily elongated ſo as to reach more than the length of the animal, excluſive of its tail. There is a cluſter of ſalivary glands ſeated around the tongue, as it enters the mouth. Theſe will neceſſarily be compreſſed by the action of the tongue; ſo as occaſionally to ſupply a plentiful flow of their ſecretion.

The ſtomach is *cartilaginus*, and analogous to that of the gallinaceous tribe of birds. It was filled with ſmall ſtones and gravel, which in this part of the country are almoſt univerſally calcareous. The inner ſurface of the ſtomach was rough to the feel, and formed into folds, the interſtices of which were filled with a frothy ſecretion. The guts were filled with a ſandy pulp, in which, however, were interſperſed a few diſtinct ſmall ſtones. No veſtiges of any animal or vegetable food could be traced in the whole primæ viæ. The gall-bladder was diſtended with a fluid reſembling in colour and conſiſtence the dregs of beer.

The ſubject was a female: its dugs were two, ſeated on the breaſt. The uterus and organs of generation were evidently thoſe of a viviparous animal.

Forcibly ſtruck with the phenomena, which this quadruped exhibited, my imagination at once overleaped the boundaries, by which ſcience endeavours to circumſcribe the productions and the ways of nature; and, believing with Buffon, *que tout ce qui peut être eſt*, I did not heſitate to conjecture, that this animal might poſſibly derive its nouriſhment from mineral ſubſtances. This idea I accordingly hazarded in an addreſs to Colonel Kyd: the ſpirit of inquiry natural to that gentleman could be ill ſatisfied by ideas thrown out apparently at random; and he ſoon called on me to explain my opinion and its foundation.

Though we have perhaps no clear idea of the manner in which vegetables extract their

their nouriſhment from earth, yet the fact being ſo, it may not be unreaſonable to ſuppoſe, that ſome animal may derive nutriment by a proceſs ſomewhat ſimilar. It appears to me, that facts produced by SPALLANZANI directly invalidate the experiments, from which he has drawn the inference, that fowls ſwallow ſtones merely from *ſtupidity*; and that ſuch ſubſtances are altogether unneceſſary to thoſe animals. He reared fowls, without permitting them ever to ſwallow ſand or ſtones; but he alſo eſtabliſhed the fact, that carnivorous animals may become frugivorous, and herbivorous animals may come to live on fleſh. A wood-pigeon he brought to thrive on putrid meat. The experiment on fowls, then, only corroborates the proof, that we have it in our power by habits to alter the natural conſtitution of animals. Again that eminent inveſtigator of truth found, that fowls died when fed on ſtones alone; but ſurely that fact is far ſhort of proving, that ſuch ſubſtances are not agreeable to the original purpoſes of nature in the digeſtive proceſs of theſe animals. When other ſubſtances ſhall have been detected in the ſtomach of this animal, my inference, from what I have ſeen, muſt neceſſarily fall to the ground. But if, like other animals with muſcular and cartilaginous ſtomachs, this ſingular quadruped conſume grain, it muſt be ſurprizing that no veſtige of ſuch food was found preſent in the whole alimentary canal, ſince in that thinly-inhabited country, the wild animals are free to feed without intruſion from man. Nor can it be inferred from the ſtructure of the ſtomach, that this animal lives on ants or on inſects. Animals devoured as food, though of conſiderable ſize and ſolidity, with a proportionally ſmall extent of ſurface to be acted on by the gaſtric juice and the action of the ſtomach, are readily diſſolved and digeſted by animals poſſeſſing not a cartilaginous, but a membranaceous, ſtomach, as for inſtance a frog in that of a ſnake.

In the ſtomach many minerals are ſoluble, and the moſt active things which we can ſwallow. Calcareous ſubſtances are readily acted on. Dr. PRIESTLEY has aſked, "May not phlogiſtic matter be the moſt eſſential part of the food and ſupport of both vegetable and animal bodies?" I confeſs, that Dr. PRIESTLEY's finding cauſe to propoſe the queſtion, inclines me to ſuppoſe, that the affirmative to it may be true. Earth ſeems to be the baſis of all animal matter. The growth of the bones muſt be attended with a conſtant ſupply, and in the human ſpecies there is a copious diſcharge of calcareous matter thrown out by the kidneys and ſalivary glands. May not the quadruped in queſtion derive phlogiſton from earth; ſalt, from mineral ſubſtances? And, as it is not deprived of the power of drinking water, what elſe is neceſſary to the ſubſiſtence of his corporeal machine?

Conſidering

Confidering the fcaly covering of this animal, we may conceive, that it may be at leaft neceffary for its exiftence, on that account, to imbibe a greater proportion of earth than is neceffary to other animals. It may deferve confideration, that birds are covered with feathers, which in their conftituent principles approach to the nature of horn and bone. Of thefe animals the gallinaceous tribe fwallow ftones; and the carnivorous take in the feathers and bones of their prey: the latter article is known to be foluble in the membranaceous ftomachs; and hence is a copious fupply of the earthy principles. In truth I do not know, that any thing is foluble in the ftomach of animals, which may not be thence abforbed into their circulating fyftem, and nothing can be fo abforbed without affecting the whole conftitution.

What I have here ftated is all that I could advance to the Colonel, but my opinion has been fince not a little confirmed by obferving the report of experiments by M. BRUQUATELLI of *Pavia*, on the authority of M. CRELL, by which we learn, that fome birds have fo great a diffolvent power in the gaftric juice as to diffolve in their ftomachs flints, rock cryftal, calcareous ftones, and fhells.

I beg only farther to obferve, that fome things in BUFFON's defcription of the Pangolin, not apparently quite applicable to this animal, might have been owing to his defcription being only from the view of a dried preparation, in which the organs of generation would be obliterated and the dugs fhrivelled away fo as to be imperceptible: elfe that elegant philofopher could not have afferted that, "*tous les animaux quadrupedes, qui font couverts d'écailles, font ovipares.*"

Excufe my prolixity, which is only in me the neceffary attendant of my fuperficial knowledge of things. In ingenuoufnefs, however, I hope that I am not inferior to any man: and I am proud to fubfcribe myfelf,

Sir,

Your moft obedient and humble fervant,

ADAM BURT.

GYA, *September* 14, 1780.

A LETTER FROM DOCTOR ANDERSON TO SIR WILLIAM JONES.

DEAR SIR,

THE male *Lac* inſect having hitherto eſcaped the obſervation of naturaliſts, I ſend the encloſed deſcription made by Mr. WILLIAM ROXBURGH, Surgeon on this eſtabliſhment, and Botaniſt to the Honourable Company, in hopes you will give it a place in the publication of your Society, as Mr. ROXBURGH's diſcovery will bring Lac a Genus into the Claſs Hemiptera of LINNÆUS.

I am, with eſteem,
Dear Sir,
Your very obedient ſervant,
JAMES ANDERSON.

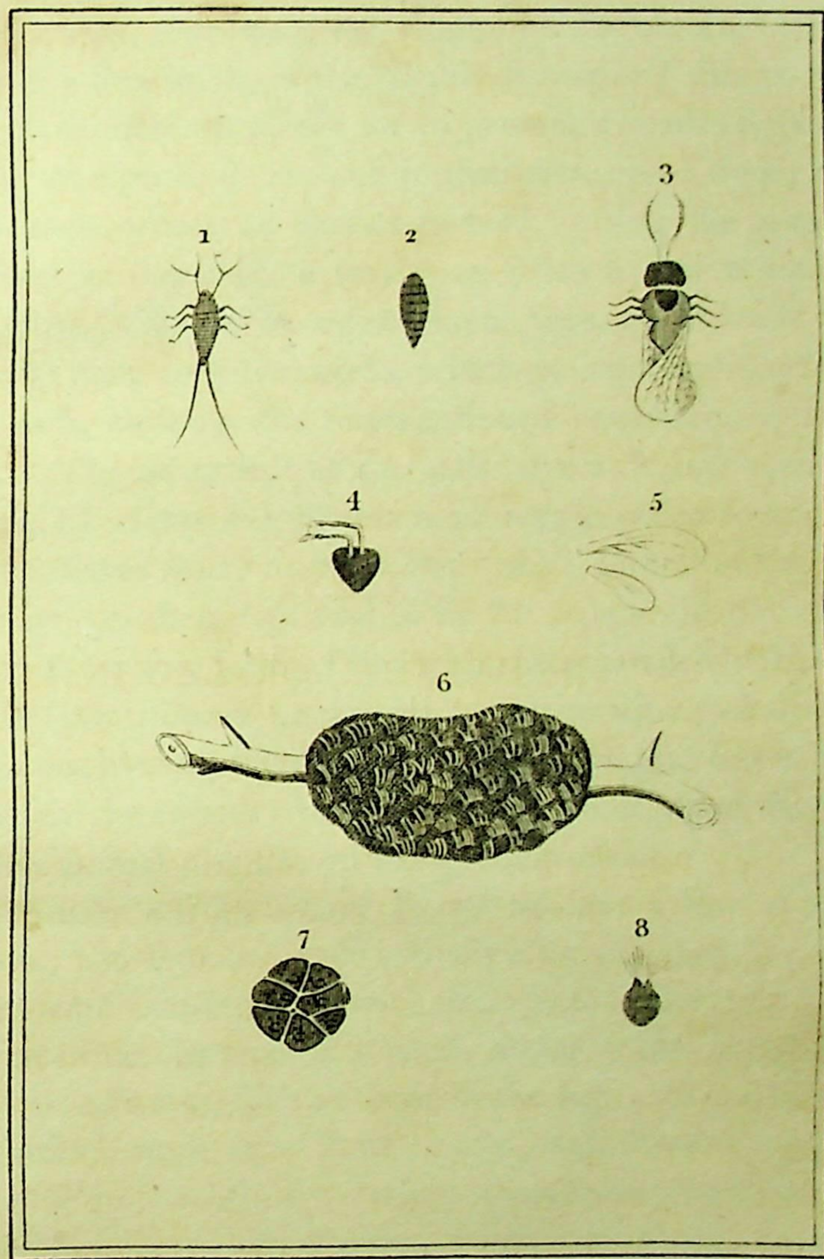
FORT ST. GEORGE, *January* 2, 1790.

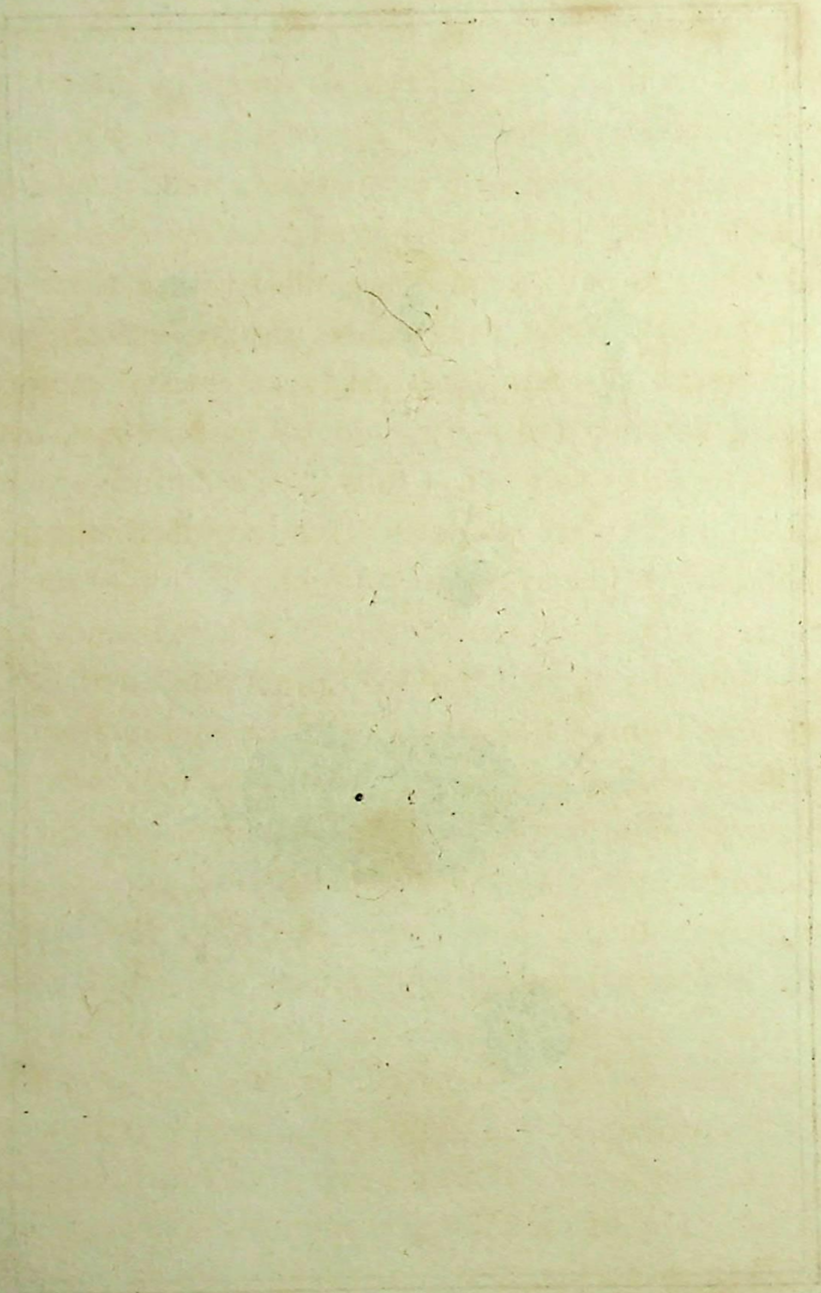
XXIV.

ON THE LA'CSHA', OR LAC INSECT.

By Mr. W. ROXBURGH.

SOME pieces of very freſh-looking lac, adhering to ſmall branches of *mimoſa cinerea*, were brought me from the mountains on the 20th of laſt month. I kept them carefully, and to-day the 4th of *December*, fourteen days from the time they came from the hills, myriads of exceedingly minute animals were obſerved creeping about the lac, and branches it adhered to, and more ſtill iſſuing from ſmall holes over the ſurface of the cells: other ſmall and perforated excreſcences were obſerved with a glaſs amongſt the perforations, from which the minute inſects iſſued, regularly two to each hole, and crowned with ſome very fine white hairs. When the hairs were rubbed off, two white ſpots appeared. The animals, when ſingle, ran about pretty briſkly, but in general they were ſo numerous as to be crowded over one another. The body is oblong, tapering moſt towards the tail, below plain, above convex, with a double, or flat margin: laterally on the back part of the thorax are two ſmall tubercles which may be the eyes: the body behind the thorax is croſſed


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croſſed with twelve rings: legs ſix: feelers (antennæ) half the length of the body, jointed, hairy, each ending in two hairs as long as the antennæ: rump, a white point between two terminal hairs, which are as long as the body of the animal. The mouth I could not ſee. On opening the cells, the ſubſtance that they were formed of cannot be better deſcribed, with reſpect to appearance, than by ſaying it is like the tranſparent amber, that beads are made of: the external covering of the cells may be about half a line thick, is remarkably ſtrong and able to reſiſt injuries: the partitions are much thinner: the cells are in general irregular ſquares, pentagons and hexagons, about an eighth of an inch in diameter, and $\frac{1}{4}$ deep: they have no communication with each other: all thoſe I opened, during the time the animals were iſſuing, contained in one half, a ſmall bag filled with a thick red jelly-like liquor replete with what I take to be eggs; theſe bags, or utriculi, adhere to the bottom of the cells, and have each two necks, which paſs through perforations in the external coat of the cells, forming the forementioned excreſcences, and ending in ſome very fine hairs. The other half of the cells have a diſtinct opening, and contain a white ſubſtance, like ſome few filaments of cotton rolled together, and numbers of the inſects themſelves ready to make their exit: ſeveral of the ſame inſects I obſerved to have drawn up their legs and to lie flat: they did not move on being touched, nor did they ſhow any ſigns of life with the greateſt irritation.

December 5. The ſame minute hexapedes continue iſſuing from their cells in numbers; they are more lively, of a deepened red colour, and fewer of the motionleſs ſort. To day I ſaw the mouth: it is a flattened point about the middle of the breaſt, which the little animal projects on being compreſſed.

December 6. The male inſects I have found to-day: a few of them are conſtantly running among the females moſt actively: as yet they are ſcarce more, I imagine, than one to 5000 females, but twice their ſize. The head is obtuſe; eyes black, very large; antennæ clavated, feathered, about $\frac{2}{5}$ the length of the body: below the middle an articulation, ſuch as thoſe in the legs: colour between the eyes a beautiful ſhining green: neck very ſhort: body oval, brown: abdomen oblong, the length of body and head: legs ſix: wings membranaceous, four, longer than the body, fixed to the ſides of the thorax, narrow at their inſertions, growing broader for $\frac{2}{3}$ of their length, then rounded: the anterior pair is twice the ſize of the poſterior: a ſtrong fibre runs along their anterior margins: they lie flat like the wings of a common flie, when it walks or reſts: no hairs from the rump: it ſprings moſt actively to a conſiderable diſtance on being touched: mouth in the under part of

of the head: maxillæ tranſverſe. To-day the female inſects continue iſſuing in great numbers, and move about as on the 4th.

December 7. The ſmall red inſects ſtill more numerous, and move about as before: winged inſects, ſtill very few, continue active. There have been freſh leaves and bits of the branches of both mimoſa cinerea and corinda put into the wide mouthed bottle with them: they walk over them indifferently without ſhowing any preference nor inclination to work nor copulate. I opened a cell whence I thought the winged flies had come, and found ſeveral, eight or ten, more in it, ſtruggling to ſhake off their incumbrances: they were in one of thoſe utriculi mentioned on the 4th, which ends in two mouths, ſhut up with fine white hairs, but one of them was open for the exit of the flies; the other would no doubt have opened in due time: this utriculus I found now perfectly dry, and divided into cells by exceeding thin partitions. I imagine, before any of the flies made their eſcape, it might have contained about twenty. In theſe minute cells with the living flies, or whence they had made their eſcape, were ſmall dry dark coloured compreſſed grains, which may be the dried excrements of the flies.

NOTE *by the* PRESIDENT.

The *Hindus* have ſix names for *Lac*; but they generally call it *Lácſhà* from the *multitude* of ſmall inſects, who, as they believe, diſcharge it from their ſtomachs, and at length deſtroy the tree on which they form their colonies: a fine *Pippala* near *Criſhnanagar* is now almoſt wholly deſtroyed by them.

XXV.

THE SEVENTH ANNIVERSARY DISCOURSE, ON THE CHINESE.

—*See the Works of Sir William Jones, Vol. I. p.* 95.

XXVI.

XXVI.

THE TRANSLATION OF AN INSCRIPTION IN THE MAGA LANGUAGE ENGRAVED ON A SILVER PLATE FOUND IN A CAVE NEAR ISLA'MABA'D.

Communicated by JOHN SHORE, *Esq.*

ON the 14th of *Mágha* 904, *Chándi Láh Rájà* *, by the advice of *Bowangari Rauli*, who was the director of his ſtudies and devotions, and in conformity to the ſentiments of twenty-eight other *Raulis*, formed the deſign of eſtabliſhing a place of religious worſhip; for which purpoſe a cave was dug, and paved with bricks, three cubits in depth, and three cubits alſo in diameter, in which were depoſited one hundred and twenty brazen images of ſmall dimenſions, denominated *Tahmúdas*; alſo, twenty brazen images larger than the former, denominated *Lángúda*; there was likewiſe a large image of ſtone called *Lángúdagári*, with a veſſel of braſs in which were depoſited two of the bones of *T'hácur*: on a ſilver plate were inſcribed the *Hauca*, or the mandates of the deity; with that alſo ſtyled *Taumah Chuckſowna Tahma*, to the ſtudy of which twenty-eight *Raulis* devote their time and attention; who, having celebrated the preſent work of devotion with feſtivals and rejoicings, erected over the cave a place of religious worſhip for the *Magas* in honour of the deity.

God ſent into the world BUDDHA AVATA'R to inſtruct and direct the ſteps of angels and of men; of whoſe birth and origin the following is a relation: when BUDDHA AVATA'R deſcended from the region of ſouls in the month of *Mágh*, and entered the body of MAHA'MA'YA', the wife of SOOTAH DANNAH, *Rájà* of *Cailàs*, her womb ſuddenly aſſumed the appearance of clear tranſparent cryſtal, in which BUDDHA appeared, beautiful as a flower, kneeling and reclining on his hands. After ten months and ten days of her pregnancy had elapſed, MAHA'MA'YA' ſolicited permiſſion from her huſband the *Rajà* to viſit her father, in conformity to which the roads were directed to be repaired and made clear for her journey; fruit-trees were planted; water veſſels placed on the road-ſide; and great illuminations prepared for the occaſion. MAHA'MA'YA' then commenced her journey, and ar-

* Perhaps, *Sándilyah*.

rived

rived at a garden adjoining to the road, where inclination led her to walk and gather flowers: at this time, being ſuddenly attacked with the pains of child-birth, ſhe laid hold on the trees for ſupport, which declined their boughs at the inſtant, for the purpoſe of concealing her perſon, while ſhe was delivered of the child; at which juncture BRAHMA' himſelf attended with a golden veſſel in his hand, on which he laid the child, and delivered it to INDRA, by whom it was committed to the charge of a female attendant; upon which the child, alighting from her arms, walked ſeven paces, whence it was taken up by MAHA'MA'YA' and carried to her houſe, and on the enſuing morning, news were circulated of a child being born in the *Rájà's* family. At this time TAPASWI *Muni*, who, reſiding in the woods, devoted his time to the worſhip of the deity, learned by inſpiration that BUDDHA was come to life in the *Rájà's* palace: he flew through the air to the *Rájà's* reſidence, where, ſitting on a throne, he ſaid, "I have repaired hither for the purpoſe of viſiting the child." BUDDHA was accordingly brought into his preſence: the *Muni* obſerved two feet fixed on his head, and, divining ſomething both of good and bad import, began to weep and to laugh alternately. The *Rájà* then queſtioned him with regard to his preſent impulſe, to whom he anſwered: "I muſt not reſide in "the ſame place with BUDDHA, when he ſhall arrive at the rank of AVATA'R: "this is the cauſe of my preſent affliction, but I am even now affected with gladneſs "by his preſence, as I am hereby abſolved from all my tranſgreſſions." The *Muni* then departed; and, after five days had elapſed, he aſſembled four *Pandits* for the purpoſe of calculating the deſtiny of the child; three of whom divined, that, as he had marks on his hand reſembling a wheel, he would at length become a *Rájà Chacraverti*; another divined, that he would arrive at the dignity of *Avatàr*.

The boy was now named SA'CYA, and had attained the age of ſixteen years; at which period it happened, that the *Rájà* CHUHIDA'N had a daughter named VASUTA'RA', whom he had engaged not to give in marriage to any one, till ſuch time as a ſuitor ſhould be found, who could brace a certain bow in his poſſeſſion, which hitherto many *Rájàs* had attempted to accompliſh without effect. SA'CYA now ſucceeded in the attempt, and accordingly obtained the *Rájà's* daughter in marriage, with whom he repaired to his own place of reſidence.

One day, as certain myſteries were revealed to him, he formed the deſign of relinquiſhing his dominion; at which time a ſon was born in his houſe whoſe name was RAGHU. SA'CYA then left his palace with only one attendant and a horſe, and, having

having croſſed the river GANGA', arrived at *Balúcálí*, where, having directed his ſervant to leave him and carry away his horſe, he laid aſide his armour.

When the world was created, there appeared five flowers, which BRAHMA' depoſited in a place of ſafety: three of them were afterwards delivered to the three *T'hácurs*, and one was preſented to SA'CYA, who diſcovered that it contained ſome pieces of wearing apparel, in which he clothed himſelf, and adopted the manners and life of a mendicant. A traveller one day paſſed by him with eight bundles of graſs on his ſhoulders, and addreſſed him, ſaying, "A long period of time has "elapſed, ſince I have ſeen the *T'hácur*; but now ſince I have the happineſs to "meet him, I beg to preſent him an offering conſiſting of theſe bundles of graſs." SA'CYA accordingly accepted of the graſs, and repoſed on it. At that time there ſuddenly appeared a golden temple containing a chair of wrought gold, and the height of the temple was thirty cubits, upon which BRAHMA' alighted, and held a canopy over the head of SA'CYA: at the ſame time INDRA deſcended with a large fan in his hand, and NA'GA, the *Rájà* of ſerpents with ſhoes in his hand, together with the four tutelar deities of the four corners of the univerſe; who all attended to do him ſervice and reverence. At this time likewiſe the chief of *Aſurs* with his forces arrived, riding on an elephant, to give battle to SA'CYA, upon which BRAHMA', INDRA, and the other deities deſerted him and vaniſhed. SA'CYA, obſerving that he was left alone, invoked the aſſiſtance of the Earth; who, attending at his ſummons, brought an inundation over all the ground, whereby the *Aſur* and his forces were vanquiſhed and compelled to retire.

At this time five holy ſcriptures deſcended from above, and SACYA was dignified with the title of BUDDHA *Avatàr*. The ſcriptures confer powers of knowledge and retroſpection, the ability of accompliſhing the impulſes of the heart, and of carrying into effect the words of the mouth. SA'CYA reſided here, without breaking his faſt, twenty-one days, and then returned to his own country, where he preſides over *Rájàs*, governing them with care and equity.

Whoever reads the *Cáric*, his body, apparel, and the place of his devotions muſt be purified; he ſhall be thereby delivered from the evil machinations of demons and of his enemies; and the ways of redemption ſhall be open to him. BUDDHA *Avatàr* inſtructed a certain *Rauli* by name ANGULI MA'LA in the writings of the *Cáric*, ſaying, "whoever ſhall read and ſtudy them, his ſoul ſhall not undergo a tranſmigration," and the ſcriptures were thence called *Anguli Málà*. There were likewiſe five other books of the *Cáric* denominated *Vachanam*, which if any one peruſe

peruſe, he ſhall thereby be exempted from poverty and the machinations of his enemies; he ſhall alſo be exalted to dignity and honours, and the length of his days ſhall be protracted: the ſtudy of the *Cáric* heals afflictions and pains of the body, and whoever ſhall have faith therein, heaven and bliſs ſhall be the reward of his piety.

XXVII.

A SUPPLEMENT TO THE ESSAY ON INDIAN CHRONOLOGY. *See the Works of Sir William Jones, Vol. I. p.* 315.

XXVIII.

ON THE SPIKENARD OF THE ANCIENTS. *See the Works of Sir William Jones, Vol. II. p.* 9.

APPENDIX.

APPENDIX.

A

METEOROLOGICAL DIARY,

KEPT AT CALCUTTA,

By HENRY TRAIL, Esq.

From 1ſt February 1784, to 31ſt December 1785.

REMARKS.

IN the following Diary of the Weather, begun the 1st of February 1784, every change in the air was marked down with the greateſt preciſion three times every day, and always nearly at the ſame hours, viz. at ſun-riſing at three, or half paſt three o'clock in the afternoon, and at eleven o'clock at night.

While the wind continued ſoutherly, the Thermometer was placed in a Verandah open to the Eſplanade, where there was at all times a free circulation of air; and when the wind became northerly, the inſtrument was removed to the oppoſite ſide of the houſe, and equally expoſed, as in the preceding part of the year.

The Barometer continued always in the ſame place.

The Hygrometer made uſe of, was a bit of fine ſponge, ſuſpended in a ſcale (on the end of a ſteel-yard) firſt prepared for more eaſily imbibing the moiſture, by dipping it in a ſolution of Salt of Tartar, afterwards drying it well, and bringing it to an equilibrium by a weight in the oppoſite ſcale, at a time when the atmoſphere appeared to have the leaſt degree of moiſture.

A ſemicircular ſcale at the top, divided from 0 to 90° on each ſide, with the needle of the yard, pointed out the quantity of moiſture gained or loſt daily; but in the following Diary the degrees of moiſture have ſeldom been taken down.

Every fall of rain was likewife taken, and the quantity in cubick inches daily noted down.

The winds were alfo obferved, and the figures 0, 1, 2, 3, 4, denote the force thereof.

Here it may be remarked, that at fun-rifing, there is feldom or ever any wind; but no fooner is the air a little rarefied by its rays, than a little breeze begins, and this generally increafes till about noon, when again it begins to lofe its force, and dies away, from the fame caufe.

In order to afcertain the influence of the Moon upon the weather, the mean temperature, as well as the weight of the atmofphere of each quarter, is accurately marked down by taking in the three days preceding, and the three days after the change with the intermediate day. From thefe, the denfity is difcovered, by the following rule given by Dr. *Bradely*, viz.

A, altitude of barometer; B, altitude of thermometer; D, denfity.

$$\frac{A}{B + 350} = D\text{—or denfity.}$$

N. B. In this, the mean morning denfity is only taken. However, the mean denfity for the whole may be found by the fame rule.

January 1, 1785. From an examination of one year's obfervations on the influence of the Moon on the mercury in the Barometer, it does not appear that there is any certain rule to be laid down regarding it. However, it may be affirmed that the direction of the winds has more effect upon it, as we never fail to fee the mercury higheft when the wind blows from the NW; in a leffer degree from the N, and loweft of all when it proceeds from the SE quarters.

A GENERAL STATE *of the* WEATHER, *for* FEBRUARY 1784.

	M.	*N.*	*E.*	
Greateſt altitude of the Thermometer, - - - - -	75°	86	76	
Leaſt ditto, - - - - - - - - - - - - - - - -	66	70	68	74$\frac{2}{3}$ Mean temperature.
Mean ditto, - - - - - - - - - - - - - - - -	72	79	73	

Clear, - - - - - - -	3	days.
Cloudy, - - - - - -	26	do.
N° days on which it rained,	8	do.
Quantity of rain. - - -	4-2	Inch.

THIS month, the wind very variable, and the atmoſphere for the moſt part cloudy, and ſometimes ſeveral days ſucceeding without any ſun—the air alſo damp and cold. Frequently thunder; and on the 8th, there was a fall of hail in the afternoon accompanied with thunder.

THE mornings generally foggy.

CALCUTTA, FEBRUARY 1784.

Day.	*Thermometer.* *M.*	*N.*	*E.*	*Mean morning denſity, of each quarter of the Moon.*	*Rain Inch*	*Wind.* *Point.*	*Force*	*Appearance of the air.*	*REMARKS.*
1	68	75	72			W	0	Cloudy,	SUNDAY.
2	68	78	72			N	0	ditto,	Heavy, with a great appear-
3	67	74	69			NE	0	ditto,	ance of rain.
4	68	77	68			S	0	ditto,	Ditto.
5	71	79	72			SW	1	ditto,	Ditto.
6	72	80	74	Full M. 70 $\frac{3}{7}$		NW	1	ditto,	A thick fog all day.
7	71	82	75			S	2	Clear,	
8	70	80	74		.1		1	Cloudy,	Some hail in the afternoon
9	74	80	75				2	ditto,	with thunder.
10	75	80	74				2	ditto,	A great appearance of rain;
11	71	77	75				1	ditto,	very dark.
12	73	79	76		.2	NW	1	ditto,	Ditto few drops of rain
13	73	80	74		.1	S	3	ditto,	Ditto ditto.
14	74	80	75	L. Q. 71 $\frac{6}{7}$	.1	NW	2	ditto,	Ditto ditto
15	70	82	72				1	ditto,	Much thunder this morning
16	72	78	74		0.5	S	2	ditto,	with a heavy ſhower.
17	70	81	72				0	Clear,	
18	69	76	72			var.	1	Hazy,	
19	69	79	74			S	0	ditto,	A few drops of rain.
20	70	77	75			W	2	ditto,	
21	73	77	74	New M. 70 $\frac{3}{7}$			1	Cloudy,	Very gloomy, and a great
22	70	75	73			N	0	Hazy,	appearance of rain; very
23	70	83	75			W	0	ditto,	cloſe, no ſun all day.
24	72	84	74				0	Cloudy,	Ditto.
25	71	76	73		0.5		1	ditto,	Clear at intervals.
26	68	70	68		.2		0	ditto,	Ditto.
27	67	74	69			NW	0	ditto,	Very thick.
28	67	79	71	F. Q. 67 $\frac{2}{7}$	.1	W	1	ditto,	Thunder, very moiſt and wet.
29	66	78	71			NW	2	Clear,	Very chilly.
mean	72	79	73		4.2	var.	2	Cloudy,	Mean ſtate of the atmoſphere.

A General State of the Weather, for March.

	M.	N.	E.	
Greatest altitude of Thermometer,	84	89	85	79 1/2 Mean temperature.
Least ditto,	66	75	71	
Mean ditto,	75	84	79	

Clear, - - - 16 days.
Cloudy, - - - 15 do.
Rain, - - - 3 do.
Quantity of do. - - - 1-8 inch.

The wind almost continually southerly, and strong blasts towards the end of the month—the weather throughout clear and serene, and heavy dews at night, which indeed must always be the case, when they are preceded by a clear warm sun.

In blowing weather dews are seldom seen, the moisture as it falls being dispelled by the wind.

The heat of the earth this month, about mid-day, about 120°.

Calcutta, March 1784.

Day.	Thermometer. M.	N.	E.	Mean morning heat, at each quarter of the Moon.	Rain Inch	Wind. Point.	Force	Appearance of the air.	REMARKS.
1	66	80	71			SW	1	Clear,	Monday.
2	67	80	71			W	1	ditto,	Moist.
3	70	82	76			S	2	ditto,	Thunder, but no rain.
4	72	85	76	Full M. 70 5/7	1	W	4	Cloudy,	Thunder, early this morning.
5	73	84	74			SE	0	Hazy,	
6	71	83	74				2	Cloudy,	
7	70	78	74				1	ditto,	Great appearance of rain.
8	69	75	74			S	1	Clear,	
9	70	80	74				1	ditto,	The weather very fine and dry
10	70	82	75				0	ditto,	Ditto.
11	70	83	75	L. Q. 73 6/7		var.	2	ditto,	Ditto.
12	69	85	75				1	ditto,	Ditto.
13	70	88	79			S	3	ditto,	Ditto.
14	75	86	81				1	ditto,	The morning foggy.
15	76	86	80				0	Cloudy,	Very close and sultry.
16	79	86	81				0	Clear,	Ditto.
17	78	86	81				0	ditto,	Ditto.
18	79	87	83	New M. 79 3/7	0.3	var.	0	Hazy,	Ditto.
19	80	88	83				3	Clear,	The wind high.
20	80	86	82				3	Cloudy,	Ditto thunder.
21	77	85	83			W	3	ditto,	Ditto.
22	80	86	83			S	2	Clear,	
23	80	88	84				0	Cloudy,	Moist.
24	80	89	83				1	ditto,	Do.
25	81	88	85	F. Q. 80 2/7	0.5		1	ditto,	Very thick.
26	83	89	84			var.	1	ditto,	A great appearance of rain.
27	84	86	80			S	4	ditto,	The wind boisterous.
28	77	82	81				3	ditto,	Ditto.
29	78	81	81				2	ditto,	Ditto.
30	79	86	83				1	Clear,	
31	80	84	81				1	ditto,	
mean	75	84	79		1.8	S	3	Clear.	Mean state of the atmosphere.

A General State *of the* Weather, *for* April 1784.

	M.	*N.*	*E.*	
Greatest altitude of the Thermometer, - - - - -	86	97	87	
Least ditto, - - - - - - - - - - - - - -	71	87	79	86¼ Mean temperature.
Mean ditto, - - - - - - - - - - - - - -	83	91	85	

Clear, - - - - - - -	14	days.
Cloudy, - - - - - -	16	ditto,
Rain, - - - - - - -	6	ditto,
Quantity of ditto, - - - -	3-1	inch.

The prevailing Wind this month, as well as the former, South; the mean heat of the earth at mid-day, 126°. Blowing and heavy weather in general, and frequent thunder storms about the end, although many of the nights were close and sultry.

The thunder storms that generally prevail at this time of the year, always happen in the afternoon or evening, and come from the NW, and are attended with loud peals and heavy fall of rain. Before these storms begin, the clouds become very dark and low, and the winds being thus confined between the clouds and earth, must, of course, be greatly augmented.

Calcutta, April 1784.

Day.	*Thermometer.* *M.*	*N.*	*E.*	*Mean morning heat, at each quarter of the Moon.*	*Rain.*	*Wind.* *Point.*	*Force*	*Appearance of the air.*	REMARKS.
1	79	89	85			S	1	Clear,	Thursday.
2	81	87	83				0	ditto,	
3	81	91	85				4	Cloudy,	Disagreeable blowing weather.
4	83	89	85				3	ditto,	Ditto.
5	83	89	86				3	ditto,	Ditto.
6	83	88	85	Full M. 82 $\frac{6}{7}$			4	Cloudy,	Ditto.
7	83	91	86				3	Hazy,	Ditto.
8	83	91	85				2	Clear,	
9	84	92	86				1	ditto,	
10	84	94	87				0	ditto,	
11	85	97	87				0	ditto,	The night very close.
12	86	95	87				0	ditto,	Ditto.
13	85	93	85	L. Q. 84 3			0	ditto,	Hard blowing weather with
14	86	92	83			SE	3	ditto,	much dust.
15	83	91	85			S	3	Cloudy,	Ditto.
16	83	90	86		0.4		3	ditto,	A heavy thunder storm, in the
17	84	89	80		1.5		4	ditto,	evening.
18	80	88	79		0.5		2	ditto,	High wind.
19	74	87	85			SW	3	ditto,	Very close.
20	83	90	85	New M. 81 $\frac{3}{7}$		NW	0	Clear,	Strong wind.
21	83	91	86			S	3	ditto,	Ditto.
22	83	92	85				3	ditto,	And close and sultry.
23	83	93	87				0	Hazy,	
24	83	92	86				3	Clear,	
25	84	90	86				3	ditto,	With rain and thunder.
26	84	89	84		0.4		4	Cloudy,	Ditto, from NW.
27	80	88	85	F. Q. 83 $\frac{2}{7}$	0.2		4	ditto,	Ditto, Ditto.
28	83	90	86				2	ditto,	Ditto.
29	85	88	85		0.1		0	ditto,	High wind.
30	84	89	85				3	ditto,	
mean	83	91	85		3.1	S	4	Cloudy,	Mean state of the atmosphere.

A General State of the Weather, for May 1784.

	M.	N.	E.	
Greateſt altitude of the Thermometer, - - - - -	85	93	88	$84\frac{2}{3}$ Mean temperature.
Leaſt ditto, - - - - - - - - - - - - - - -	75	82	74	
Mean ditto, - - - - - - - - - - - - - - -	81	89	84	

Clear, - - - - - - 7 days.
Cloudy, - - - - - 24 ditto.
Rain, - - - - - - - 14 ditto.
Quantity of ditto, - - - 9·6 inches.

The Wind ſoutherly, with a few pretty violent ſtorms from the NW, at the beginning of the month, while the latter part was cloſe, gloomy, and warm; but, in general, the whole month was exceedingly cloudy, and ſcarcely a ſingle day of bright ſun ſhine.

The Rains began on the 22d, and from that day to the end the nights were very cloſe and ſultry and the air very damp.

Calcutta, May 1784.

Day.	Thermometer. M.	Thermometer. N.	Thermometer. E.	Mean morning heat, at each quarter of the Moon.	Rain.	Wind. Point.	Wind. Force.	Appearance of the air.	REMARKS.
1	82	86	82		2.	S	3	Cloudy,	Saturday, a violent ſtorm.
2	77	88	74		1.		3	ditto,	Very heavy. Ditto, no ſun.
3	75	82	79		0.6		4	ditto,	Ditto.
4	78	87	84				1	Hazy,	And cloſe.
5	82	89	84	Full M. $79\frac{6}{7}$			1	ditto,	No ſun all day.
6	81	90	85		0.5		2	ditto,	A thunder ſtorm in the evening.
7	84	90	85				3	ditto,	High wind at times.
8	82	90	86				3	Clear,	Ditto.
9	83	90	87				2	Hazy,	
10	84	90	87		0.4		3	Cloudy,	Very thick and dark.
11	85	89	78			SE	2	ditto,	
12	75	88	84	L. Q. $79\frac{6}{7}$	0.8	E	2	ditto,	A thunder ſtorm in the evening.
13	77	85	80		2.	S	1	ditto,	
14	75	85	83			var.	0	ditto,	No wind.
15	80	88	84			S	0	Clear,	
16	80	90	83		0.2		1	ditto,	Thunder in the evening.
17	78	91	86				0	ditto,	The weather very cloſe and ſtill.
18	83	91	87				0	ditto,	Ditto.
19	84	90	87	New M. $82\frac{6}{7}$			1	ditto,	Ditto.
20	85	92	87				1	Cloudy,	At intervals.
21	85	93	88				0	Clear,	Very ſtill.
22	85	91	85		0.6		2	Cloudy,	Thunder in the evening.
23	84	90	83		0.4		2	ditto,	Ditto.
24	82	89	85				2	ditto,	Ditto.
25	83	92	86		0.2		1	ditto,	Ditto.
26	84	85	84		0.1		2	ditto,	Ditto.
27	81	82	83	F. Q. $81\frac{6}{7}$	0.2	SE	2	ditto,	Ditto.
28	80	86	83			NW	3	ditto,	A great appearance of rain.
29	81	89	84		0.4	NW	2	ditto,	The nights very ſultry.
30	82	89	85			NW	3	ditto,	Ditto.
31	83	92	86		0.2	S	2	ditto,	Thunder ditto.
mean	81	89	84		9.6	S	2	Cloudy,	Mean ſtate of the atmoſphere.

A GENERAL STATE *of the* WEATHER, *for* JUNE 1784.

	M.	N.	E.	
Greateſt altitude of the Thermometer, - - - - - -	84	90	86	83 Mean temperature.
Leaſt ditto, - - - - - - - - - - - - - - - -	77	80	78	
Mean ditto, - - - - - - - - - - - - - - - - -	81	85	83	

Clear, - - - - - - - - - - 1 day.
Cloudy, - - - - - - - - - - 29 days.
Rain, - - - - - - - - - - 14 ditto.
Quantity of ditto, - - - - - - 17-4 inches.

THE wind, this month, inclining ſometimes to the E of S. The atmoſphere exceedingly moiſt and wet, and much rain from the 10th to 17th, the ſky moſtly clouded throughout, and very little variation in the temperature of the air.

CALCUTTA, JUNE 1784.

Day.	Thermometer. M.	N.	E.	Mean heat at each quarter of the Moon.	Rain.	Wind. Point.	Force	Appearance of the air.	REMARKS.
1	82	82	82		0.7	S	1	Cloudy,	TUESDAY, thunder.
2	80	86	84		1.2		1	ditto,	
3	82	84	83				1	ditto,	
4	82	85	82	Full M. 81 3/7	0.2		1	ditto,	A gentle ſhower.
5	81	87	85			var.	0	ditto,	Cloſe.
6	82	90	85				0	ditto,	
7	83	85	84		0.5		1	ditto,	
8	81	84	82		1.6	NE	1	ditto,	Several ſhowers.
9	80	84	83				0	ditto,	
10	81	83	82	L. Q. 80 1/7	1.1		0	ditto,	No ſun all day.
11	79	80	80		1.6	S	1	ditto,	Inceſſant rain all day.
12	78	78	78		4.6		3	ditto,	Ditto
13	77	80	80		0.1		1	ditto,	
14	80	85	80		0.4		2	ditto,	Thunder in the evening.
15	81	85	82		0.1	W	2	Hazy,	No ſun all day.
16	80	82	79		2.5	var.	1	Cloudy,	Ditto.
17	80	83	83		0.8	S	0	ditto,	Ditto.
18	81	89	85	New M. 81 1/7			1	Hazy,	Ditto.
19	81	88	85				1	ditto,	Sun very faint.
20	82	88	86				1	ditto,	Very thick and no ſun.
21	84	90	85			SE	1	ditto,	The nights very cloſe.
22	84	88	85			SE	1	ditto,	Ditto.
23	82	88	85				1	ditto,	Ditto.
24	82	90	84				1	ditto,	Ditto.
25	83	90	86			var.	0	ditto,	Ditto.
26	83	89	84	F. Q. 82		SE	0	Cloudy,	Ditto.
27	82	87	84			S	0	Hazy,	Ditto.
28	83	87	83				0	Cloudy,	
29	81	81	81		2 1	var.	1	ditto,	Thunder.
30	81	88	83			S	3	Clear,	High wind.
mean	81	85	83		17.4	S&SE	1	Cloudy,	Mean ſtate of the atmoſphere.

A GENERAL STATE *of the* WEATHER, *for* JULY 1784.

	M.	N.	E.	
Greatest altitude of Thermometer, - - - - - - -	84	90	85	83 Mean temperature.
Least ditto, - - - - - - - - - - - - - - -	77	77	78	
Mean ditto, - - - - - - - - - - - - - - -	81	85	83	

Clear, - - - - - -	1	day.
Cloudy, - - - - -	30	days.
Rain, - - - - - -	20	ditto.
Quantity of ditto, - -	15	Inches.

THE prevailing wind SE, and the atmosphere, as the former month, exceeding thick and humid, and very little sun shine. The mean temperature, exactly the same as last month, and very little variation between the heat at mid-day, and that of the morning and evening.

DURING the rains, the wind is often variable, but commonly it comes round to the Eastward when there falls much rain.

CALCUTTA, JULY 1784.

Day.	Thermometer. M.	N.	E.	Mean morning heat, at each quarter of the Moon.	Rain.	Wind. Point.	Force.	Appearance of the air.	REMARKS.
1	81	89	84	THURSDAY.		S	3	Clear,	The wind strong in the morning,
2	83	88	84				2	Cloudy,	but the nights very still and
3	83	83	83			SE	2	ditto,	close.
4	80	86	84	Full M. 82			3	ditto,	
5	84	89	84				2	Hazy,	
6	84	88	84		0.4		1	Cloudy,	The night very bright.
7	83	85	84				0	ditto,	Ditto thunder.
8	82	85	84		0.3		0	ditto,	Ditto.
9	82	86	84	L. Q. 82 $\frac{2}{7}$	0.1		1	ditto,	Ditto.
10	82	90	85		0.1		1	ditto,	Much lightning in the evening.
11	83	86	83		1.1	var.	1	ditto,	
12	82	86	84		0.9		1	ditto,	Several small showers.
13	83	86	84		0.3		2	ditto,	
14	81	84	82		0.2		1	ditto,	
15	79	83	82		2.6		1	ditto,	Rained all day.
16	82	83	82			SE	0	ditto,	
17	78	83	82	New M. 79 $\frac{5}{7}$	0.9		1	ditto,	Small rain, very dark.
18	79	85	82		0.1		2	ditto,	On the 7th, there had been no
19	79	84	82		0.1		1	ditto,	rain at Chunar, many per-
20	80	85	81			S	3	ditto,	sons sick, but chiefly among
21	77	83	80		0.1	SE	1	ditto,	the Natives.
22	79	84	82		0.3		1	ditto,	
23	80	85	79		1.7		0	ditto,	Much thunder and lightning.
24	79	83	80				1	ditto,	
25	79	83	81	F. Q. 79 $\frac{6}{7}$	0.1	E	1	ditto,	
26	80	86	82		0.1	SE	1	ditto,	Thunder.
27	81	86	83		0.2		1	ditto,	
28	81	86	84			SW	1	ditto,	
29	83	86	83			S	3	ditto,	High winds.
30	81	82	79		1.8	SW	1	ditto,	Thunder.
31	78	77	78		3.6		1	ditto,	Rain all day.
mean	81	85	83		15.	S&SE	1	Cloudy,	Mean state of the atmosphere.

A General State of the Weather, for August 1784.

		M.	N.	E.	
THERMOMETER,	Greatest altitude, - - - - -	83°	89°	84°	82 ⅔ Mean temperature.
	Least ditto, - - - - - - -	77	80	80	
	Mean ditto, - - - - - - -	81	85	82	
BAROMETER,	Greatest ditto, in. - - - - -	29.75	29.75	29.76	Mean state of the atmosphere — 29.57.
	Least ditto, - - - - - - -	29.57	29.56	29.61	
	Mean ditto, - - - - - - -	29.67	29.66	29.70	
	Greatest variation, - - - - -	.18	.19	.15	
	Mean density, - - - - - -	.688	.682	.683	686 density.
HYGROMETER,	Greatest moisture, - - - - -	50°	45°	45°	
	Ditto drought, - - - - - -	15	10	10	
	Mean drought and moisture, - -	3d 28m	1d 18m	1d 15m	

Clear - - - - 5 days.
Cloudy, - - 26 ditto.
Rain, - - - 23 ditto.
Quantity ditto, 16-9 inches.

The air still very moist, and very little sun shine, although the nights in general were very bright and fine: frequently thunder, and on the 22d, an exceeding loud peal early in the morning. The quantity of rain that fell this month was very considerable, and every thing imbibing the moisture to the highest degree.

The Barometer is almost invariably higher at night than in the morning, and lowest always at mid-day. The air being much loaded with moisture, the whole of this month, the variation of the mercury was very insensible. The same causes kept the Thermometer nearly stationary also.

Calcutta, August 1784.

Day.	Thermometer. M	N	E.	Mean density at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	M. m.	N. d.	N. m.	E. d.	E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	77	83	80	F. M.	29.64	29.64	29.73	10	15	10				1.2	S	0	1	0	Cloudy,
2	80	86	82	SUN-	.69	.69	.73		15	5				0.4		0	1	0	ditto,
3	81	86	83	DAY.	.70	.63	.70	15	20		20					1	1	1	ditto,
4	82	88	83		.66	.64	.66	15	25		20			0.4	SE	0	1	0	Clear,
5	82	86	83		.64	.63	.71	15	30		15			0.3	E	1	1	0	Cloudy,
6	81	86	83		.70	.70	.75	12	30	0	0			0.1	SE	1	1	1	ditto,
7	82	86	83	L. Q. 687	.75	.70	.74	10	40		5			0.2		0	1	0	ditto,
8	81	89	84		.74	.72	.72	10	35		10				S	1	2	1	Clear,
9	82	87	83		.70	.70	.73	15	35		30					0	1	0	ditto,
10	82	87	83		.73	.73	.75	40	40		30		30			1	0	1	ditto,
11	83	82	83		.72	.72	.73		40		40		40	0.4		1	2	0	Cloudy,
12	82	83	81		.70	.72	.74		45	2			8	0.7	SE	1	2	0	ditto,
13	81	87	83		.72	.72	.76		15	10			10			0	1	1	ditto,
14	81	83	81		.73	.73	.77		20		20	10		0.8		1	1	0	ditto,
15	81	83	81		.74	.72	.74		10		35		25	0.7	S	0	0	0	ditto,
16	79	84	82	N. M. 689	.70	.60	.64		40		35		25	1.5	SE	1	0	0	ditto,
17	81	83	80		.60	.56	.61		25		40		30	2.5		1	1	0	ditto,
18	79	83	80		.58	.56	.64		45		30		40	2.8		0	2	1	ditto,
19	77	80	80		.65	.69	.74		45		45		30	0.8		1	1	1	ditto,
20	78	84	81		.74	.75	.72		40		35		45	0.5		1	2	2	ditto,
21	79	87	83		.72	.63	.69		50		15		35		SW	0	1	0	Clear,
22	80	86	83		.65	.64	.69		45		25		12	1.9		2	0	0	Hazy,
23	82	87	83	F. Q. 689	.67	.61	.67		30	0	0		20	0.2	S	0	0	0	Cloudy,
24	82	87	84		.64	.59	.66		30	0	0		5		SE	0	1	0	ditto,
25	83	86	84		.64	.64	.64		15	8			5	0.2	E	0	1	1	ditto,
26	81	85	81		.60	.56	.63		10		5	10		0.3	SE	2	2	1	ditto,
27	80	84	81		.60	.59	.62		8		5		6	0.1		2	3	2	ditto,
28	80	85	83		.59	.64	.65		10		15		20	0.2		2	3	2	ditto,
29	81	87	83	F.M. 688	.64	.68	.68		33	0	0		5	0.6	SW	3	3	3	ditto,
30	81	85	83		.66	.66	.69		20		15		10		SW	2	2	2	ditto,
31	80	84	83		.66	.69	.74		25		25		35	0.1	S	2	2	1	ditto.
mean	81	85	82		29.67	29.66	29.70	3	28	1	18	1	15	16.9	S&SE	1	1⅓	⅔	Cloudy.

A General State *of the* Weather, *for* September 1784.

		M.	*N.*	*E.*	
Thermometer,	Greatest altitude, - - - - -	84°	90°	85°	82⅓ Mean temperature,
	Least ditto, - - - - - - -	76	77	78	
	Mean ditto, - - - - - - -	80	85	81½	
Barometer,	Greatest ditto, in. - - - - -	29.95	29.90	29.97	Mean state of the atmosphere — 29.81.
	Least ditto, - - - - - - -	29.72	29.68	29.75	
	Mean ditto, - - - - - - -	29.81	29.80	29.83	
	Greatest variation, - - - - -	0.23	0.22	0.22	
	Mean density, - - - - - -	.693	.685	.692	.690 density.
Hygrometer,	Greatest moisture, - - - - -	60°	60°	60°	
	Ditto drought, - - - - - -	10	40	25	
	Mean density and moisture, - -	½d 24m	10d 14m	5d 15m	

Clear, - - - 10 days,
Cloudy, - - - 20 ditto.
Rain, - - - 12 ditto.
Quantity ditto, - 11-3 inches.

The wind generally S and SE, much lightning in the evenings but not attended either with rain or thunder. The air still damp and cloudy, although the Barometer stood considerably higher than the preceding month.

It is worthy of observation, that upon the rains going off, the water falls in larger drops than at any other period of the season, and probably this may be occasioned from the height it has to fall: and in proof of this, the opposite stations of the Barometer need only be consulted, where it appears, that the weight of the atmosphere was greatly increased about the last period of the rains.

Calcutta, September 1784.

Day.	*Thermometer.*			*Mean density at each quarter of the Moon.*	*Barometer.*			*Hygrometer.*						*Rain.*	*Wind and Force.*				
	M.	*N.*	*E.*		*M.*	*N.*	*E.*	*M.* *d.*	*M.* *m.*	*N.* *d.*	*N.* *m.*	*E.* *d.*	*E.* *m.*		*Point.*	*M.*	*N.*	*E.*	
1	81	86	83	Wed.	29.72	29.72	29.79		40		5		20		S	0	1	1	Cloudy,
2	81	89	84		.79	.82	.84		25	5			5		SE	0	1	0	Clear,
3	83	83	82		.84	.81	.84		25		20		25	2.0	SW	0	1	0	Cloudy,
4	81	87	83		.82	.78	.76		35		20		15			1	1	1	Hazy,
5	81	88	83		.74	.78	.75		30		20		20			1	1	0	ditto,
6	82	89	83	L. Q.	.75	.77	.78		20		20		5			0	1	1	Cloudy,
7	81	89	83	691	.77	.82	.81		25	15	0		20		S	1	1	1	Clear,
8	81	88	83		.80	.83	.80		15	12		10			S	0	1	1	ditto,
9	82	89	84		.79	.72	.78		5	30		5			SW	0	2	0	ditto,
10	82	90	83		.76	.72	.78		5	35		20			SE	0	1	2	ditto,
11	84	90	85		.78	.78	.81	10		40		25			NE	0	2	1	ditto,
12	84	87	84		.81	.80	.79		0	20		20		0.5		0	1	0	Cloudy &
13	81	87	83		.77	.75	.76		25	20		20			N	1	1	0	heavy,
14	82	84	82	N. M.	.72	.68	.78		15	10		10			NE	1	1	1	ditto,
15	77	82	80	691	.77	.80	.80		15	0	0	0		0.7	SE	1	1	1	ditto,
16	79	81	81		.78	.80	.76		20		5		15	0.3		1	1	1	ditto,
17	79	80	79		.93	.70	.78		18		25		30	1.5		1	2	1	ditto,
18	77	81	78		.79	.77	.84		35		38		38	0.9		0	1	1	ditto,
19	76	77	78		.84	.89	.87		50		53		55	1.2		1	1	1	ditto,
20	78	80	79		.88	.89	.91		60		60		55	1.1		1	0	1	ditto,
21	78	80	78		.92	.89	.95		60		55		60	0.3	SE	1	1	1	ditto,
22	79	80	80	F. Q.	.95	.90	.97		60		45		45	1.1	E	1	0	0	ditto,
23	78	83	80	698	.94	.88	.92		45		30		35	0.1	SE	0	1	0	ditto,
24	79	84	80		.92	.84	.88		40		20		30		S	0	1	0	ditto,
25	79	85	80		.88	.84	.86		35		0		5		SE	0	1	0	ditto,
26	78	86	82		.87	.84	.86		20	20		5			SE	0	1	1	Clear,
27	80	83	79		.80	.84	.80		5		0	5		1.6	var.	0	2	1	Cloudy,
28	79	85	82	F. M.	.80	.77	.83		15	20		5			S	0	2	1	Clear,
29	80	88	84	694	.84	.81	.89		10	35		20			SE	0	1	1	ditto,
30	83	89	83		.89	.87	.93	5		35		15				0	1	0	ditto,
mean	8[illegible]	85	81½		29.81	29.80	29.83	½	24	10	14	5	15	11.3	SE & S	½	1	⅔	Cloudy.

A GENERAL STATE *of the* WEATHER, *for* OCTOBER 1784.

		M.	N.	E.	
THERMOMETER,	Greateft altitude, - - - - -	83	90	85	82 ½ Mean temperature.
	Leaft ditto, - - - - - -	74	77	76	
	Mean ditto, - - - - - -	79	86½	82½	
BAROMETER,	Greateft ditto, in. - - - - -	30.04	30.00	30.02	Mean ftate of the atmofphere. — 29.91
	Leaft ditto, - - - - - -	29.74	29.77	29.76	
	Mean ditto, - - - - - -	29.92	29.91	29.92	
	Greateft variation, - - - - -	0.30	0.23	0.26	
	Mean denfity, - - - - - -	.697	.686	.693	.692 denfity,
HYGROMETER,	Greateft moifture, - - - - -	48	25	30	
	Ditto drought, - - - - - -	30	50	45	
	Mean moifture and drought, - -	5d 7m	30d 1m	22d 2m	

Clear, - - - - - 19 days,
Cloudy, - - - - 12 ditto,
Rain, - - - - - 3 days,
Quantity of ditto, - - 0-8 inches,

THE air very clear and elaftic, and heavy dews at night. The Barometer very high, and the wind W and NW.

ABOUT the middle of the month, the mornings became a little foggy, which indicates the approach, or beginning, of the cold feafon: The atmofphere thin and dry, and cleared of its vapours; of courfe the mercury rofe in the Barometer.

As the difference between the day and the night heat begins now to be greater than in any of the eight preceding months, the fogs we have at this feafon of the year are by that means formed.

CALCUTTA, OCTOBER 1784.

Day.	Thermometer. M	N.	E.	Mean denfity at each quarter of the Moon.	Barometer: M.	N.	E.	Hygrometer. M. d.	M. m.	N. d.	N. m	E. d	E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	83	89	82	FRI.	29.91	29.93	29.93	3		35		10		0.6	SE	0	3	1	Cloudy,
2	81	82	80		.94	.90	.92		10	15		0		0.1	S	1	3	1	ditto,
3	80	85	83		.90	.83	.87		15	15		5			SE	0	1	1	ditto,
4	80	88	84		.83	.77	.86		15	25		15			S	0	2	0	ditto,
5	82	88	84		.78	.78	.78		5	25		15			NE	0	3	0	ditto,
6	81	90	83	L. Q.	.76	.78	.76		0	20		15		0.1	var.	0	1	1	Clear,
7	82	87	82	692	.74	.77	.77	5		20		15				0	1	1	ditto,
8	82	88	83		.77	.77	.83	5		40		35			W	0	1	0	Cloudy,
9	80	89	82		.83	.87	.86	10		40		35			W	1	1	0	Clear,
10	79	89	82		.88	.87	.86	15		40		35				0	1	0	ditto,
11	99	90	83		30.03	.96	30.	15		40		30				0	1	1	ditto,
12	81	88	85		29.98	.94	29.97		25	25		15				0	2	0	ditto,
13	81	89	85		.99	.92	.94		10	25		15				0	1	1	ditto,
14	80	89	84	N. M.	.93	.89	.92			30		15				1	1	0	ditto,
15	80	87	82	696	.92	.92	.91		10	40		20				0	1	0	ditto,
16	79	89	83		.91	.93	.93		10	35		30			SW	0	1	0	ditto,
17	78	88	83		.94	30.	.94		0	35		30			SW	0	1	0	ditto,
18	80	87	83		.94	29.97	.96		0	35		30			W	0	1	0	ditto,
19	80	89	83		30.02	.98	30.01		0	40		25			NW	0	1	0	ditto,
20	77	88	82		.04	.98	29.98	10		45		30				0	1	0	ditto,
21	78	88	82		29.98	.96	.99	20		50		45				0	1	0	ditto,
22	78	87	83	F. Q.	30.	.99	.98	30		50		40				0	1	0	Cloudy,
23	77	80	76	702	29.95	.94	.93	10		0			30	0.05		1	2	1	ditto,
24	75	77	76		.88	.89	.92		40		25		25		N	3	3	0	ditto,
25	74	84	79		.92	.88	.93		35	5			5		NW	1	1	0	ditto,
26	76	83	80		.93	.90	.92		20	15		10				1	1	0	ditto,
27	76	86	80		.92	.89	.94		5	30		20				1	1	1	ditto,
28	75	86	80	F. M.	.94	.94	.99		0	40		35				1	1	0	Clear,
29	76	83	80	705	.99	30.	.99	10		35		30				0	1	0	ditto,
30	75	85	80		.98	29.95	30.	10		40		40				0	2	0	ditto,
31	75	85	80		30.	30.	30.02	20		45		40				0	1	0	ditto,
mean	79	86½	82½		29.29	29.91	29.92	5	7	30	1	22	2	0.8	WNW	⅓	1½	⅓	Clear,

A General State of the Weather, for November 1784.

		M.	N.	E.	
Thermometer,	Greatest altitude - - - - -	78°	86	80	76 Mean temperature,
	Least ditto, - - - - - -	66	76	71	
	Mean ditto, - - - - - -	71	80⅔	75½	
Barometer,	Greatest ditto, in. - - - - -	30.12	30.05	30.08	30.00 mean state of the atmosphere,
	Least ditto, - - - - - -	29.60	29.88	29.92	
	Mean ditto, - - - - - -	30.00	29.99	30.02	
	Greatest variation, - - - - -	00.52	00 17	00.16	
	Mean density, - - - - - -	.712	.696	.706	702 density.
Hygrometer,	Greatest moisture, - - - -	40	15	15	
	Ditto drought, - - - - -	45	55	50	
	Mean moisture and drought, -	8m 10d	½m 35d	1m 28d	

Clear, - - - - - 23 days.
Cloudy, - - - - - 7 ditto.
Rain, - - - - - 1 ditto.
Quantity of ditto, - - 0-9 inches.

The N W winds prevailed this month, but nothing remarkable in the changes of the atmosphere, although there were several appearances of rain in the course of it. The air more elastic than any of the former months, also more serene and dry. The foggy mornings still keep off.

In clear dry weather, there is always a very sensible change on the Barometer, two or three hours after sun rising; it being often near one-tenth of an inch higher about nine o'clock, than at six or sun rise. May not this be owing to the load of vapour condensed and kept near the surface of the earth from the coldness of the night, which as it is gradually rarefied by the heat of the sun, must increase the weight and spring of the atmosphere, and produce this variation? From hence, the Barometer is always higher in the evening before these watery particles fall, than in the morning when the air is replete.

Calcutta, November 1784.

Day.	Thermometer.			Mean density at each quarter of the Moon.	Barometer.			Hygrometer.						Rain.	Wind and Force.				
	M.	N.	E.		M.	N.	E.	M.		N.		E.			Point.	M.	N.	E.	
								d.	m.	d.	m.	d.	m.						
1	74	85	80	Mon.	30.02	29.99	30.03	20	1	45		35			NW	0	1	0	Clear,
2	77	85	80	L. Q. 705	.05	.96	.00	15		40		30				0	1	0	Cloudy,
3	77	86	80		.00	.98	.02	10		40		30				0	1	0	Clear,
4	76	85	80		.02	30.00	.03	0		35		35				0	2	0	Cloudy,
5	78	85	79		.00	29.97	.02	5		40		35				0	1	0	Clear,
6	76	84	80		.00	30.00	.02	0		40		35				1	2	0	ditto,
7	76	86	79		.02	.02	.02	20		45		45				0	2	1	ditto,
8	73	82	78		.02	.02	.00	35		50		50				0	1	0	ditto,
9	72	83	76	N. M. 707	.02	.02	.06	45		55		50				1	1	0	ditto,
10	72	81	78		.10	.08	.08	30		50		45			N	1	1	0	Cloudy,
11	74	76	76		.12	.05	.07	15		0		35		0.9	NE	0	2	0	ditto,
12	75	79	76		.07	.04	.05		40		15		15		N	0	1	0	Clear,
13	71	81	77		.05	29.98	.02		40	30			15			0	1	0	ditto,
14	77	79	75		29.60	.89	29.92		10	25		20			NE	1	1	0	ditto,
15	74	80	75		.94	.95	30.00		20	25		15				0	1	0	ditto,
16	73	81	73		30.01	30.05	.07		20	40		15			N	0	1	0	ditto,
17	66	80	72	F. Q. 718	.07	.03	.06		0	50		35			NE	1	2	1	ditto,
18	67	78	74		.04	.02	.04	15		45		40			NW	0	1	1	ditto,
19	68	78	72		.03	29.99	.04	10		45		40			N	1	1	0	ditto,
20	69	78	75		.03	30.02	.05	15		40		35			NW	0	1	0	ditto,
21	69	79	74		.02	29.97	.02	5		40		35				0	1	0	ditto,
22	68	78	73		29.98	.93	29.97	0		40		30				0	0	0	Hazy,
23	69	78	72		.97	.92	.94	0	5	35		15			N	1	1	0	Clear,
24	70	78	73	F. M. 717	.90	.88	.95		35	5					NW	1	1	0	Cloudy,
25	68	78	71		.92	.96	30.02		35		5		5			0	2	0	ditto,
26	67	79	73		30.03	30.03	.04		40	20		20				0	1	0	Clear,
27	67	79	73		.00	.00	.03	20		35		30				1	1	0	ditto,
28	69	80	75		.00	.00	.03	10		35		30				0	1	0	ditto,
29	67	80	73		.02	29.99	.04	15		45		20			N	0	1	1	ditto,
30	67	80	73		.05	30.04	.08	20		50		30			NW	1	2	1	ditto,
mean	71½	80⅔	75½		30.00	29.99	30.02	10	8	35	½	28	1	0.9	NW	⅓	1⅓	⅙	Clear.

A General State of the Weather, for December 1784.

		M.	N.	E.	
Thermometer,	Greateſt altitude - - - - - -	69	79	73	$68\frac{2}{3}$ Mean heat.
	Leaſt ditto, - - - - - - -	58	63	65	
	Mean ditto, - - - - - - -	$63\frac{1}{2}$	74	$68\frac{1}{2}$	
Barometer,	Greateſt ditto, - - - - - - -	30.17	30.14	30.17	$30^{\circ}.08$ Mean ſtate of the atmoſphere.
	Leaſt ditto, - - - - - - -	30.02	30.00.	30.02	
	Mean ditto, - - - - - - -	30.09	30.07	30.09	
	Greateſt variation, - - - - - -	00.15	00.14	00.15	
	Mean denſity, - - - - - - -	.727	.709	.721	.717 Mean denſity.
Hygrometer,	Mean moiſture and drought, -	24d.	48d.	38d.	

Clear, - - - - - - 26 days.
Cloudy, - - - - - - 5 ditto.
Rain, - - - - - - 1 ditto.
Quantity of ditto, - - 0.05 inches.

The winds were conſtantly NW, except a few days, when it was inclined a little to the E, which always brings on cloudy thick weather. The whole month remarkably dry, and the atmoſphere of ſuch a denſity as greatly to exceed any of the former. At this ſeaſon of the year, there is generally a thick diſagreeable fog in the mornings and evenings; however, this month, on the contrary, has been very clear and ſerene, and but ſeldom thick fogs at either of theſe times.

Calcutta, December 1784.

Day.	Thermometer. M	N.	E.	Mean denſity at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	M. m.	N. d.	N. m.	E. d.	E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	65	79	72		30.07	30.10	30.10	20		45		30		0.05	NE	1	1	1	Cloudy,
2	68	76	72		.07	.04	.07	40		50		30				1	1	0	ditto,
3	69	78	72		.03	.01	.06	20		40		20				0	1	0	ditto,
4	67	78	73	L. Q. 721	.06	.05	.09	15		30		15			NW	1	2	1	ditto,
5	65	79	72		.10	.08	.09	0		45		25				1	2	0	Clear,
6	65	75	70		.08	.05	.10	30		50		45				2	3	0	ditto,
7	63	75	68		.08	.03	.05	45		55		45				1	2	1	ditto,
8	61	74	68		.07	.04	09	40		55		45				2	1	0	ditto,
9	61	75	69		.07	.06	.07	30		55		45				2	1	0	ditto,
10	62	75	68		.08	.06	.07	[illegible]		55		40				1	1	0	ditto,
11	61	75	68		.07	.04	.08	30		55		45				1	1	0	ditto,
12	62	73	68	N. M. 728	.09	.03	.08	20		40		35				1	0	0	ditto,
13	62	74	69		.08	.04	.05	10		40		40				0	1	0	ditto,
14	64	71	69		.05	.01	.04	20		35		25			N	0	0	0	Cloudy,
15	66	73	68		.04	.07	.0	20		40		35			NNE	1	1	0	ditto,
16	64	75	70		.09	.06	.08	30		45		40			NW	0	1	0	Clear,
17	67	75	70		.07	.01	.02	30		40		30				0	1	0	ditto,
18	66	76	72		.02	.00	.07	10		40		25			NE	0	2	0	ditto,
19	67	75	71	F. Q. 725	.06	.06	.07	0		50		25			W	0	1	0	ditto,
20	66	75	66		.06	.05	.08	25		55		40			NW	0	1	0	ditto,
21	65	74	67		.11	.10	.13	35		60		50				0	1	0	ditto,
22	61	71	65		.17	.13	.17	45		50		50				0	2	0	ditto,
23	58	71	65		.17	.12	.14	35		45		40				1	1	0	ditto,
24	60	72	66		.14	.13	.14	10		50		40				1	1	0	ditto,
25	60	72	68		.15	.14	.1[illegible]	15		45		45				0	1	0	ditto,
26	61	73	68	F. M. 732	.17	.14	.14	5		45		35				1	2	0	ditto,
27	61	73	68		.15	.13	.14	15		50		40				1	2	0	ditto,
28	60	72	67		.14	.10	.13	20		55		40				1	1	0	ditto,
29	60	70	65		.10	.10	.10	30		55		45			W	0	1	0	ditto,
30	60	69	65		.10	.06	.07	40		55		45			NW	0	1	0	ditto,
31	60	68	65		.08	.05	.06	40		55		45				0	1	0	ditto,
mean	$63\frac{1}{2}$	74	$68\frac{1}{2}$		30.09	30.07	30.09	24		48		38		0.05		$\frac{2}{3}$	$1\frac{1}{2}$	$\frac{1}{10}$	

A GENERAL STATE *of the* WEATHER, *for* JANUARY 1785.

		M.	*N.*	*E.*	
THERMOMETER,	Greateſt altitude, - - - - -	70	78	74	66 Mean heat.
	Leaſt ditto, - - - - - - -	57	69	64	
	Mean ditto, - - - - - - -	61	72	66⅔	
BAROMETER,	Greateſt ditto, - - - - - -	30.17	30.14	30.17	Mean ſtate of the atmoſphere. — 30.08
	Leaſt ditto, - - - - - - -	29.98	29.97	30.03	
	Mean ditto, - - - - - - -	30.08	30.07	30.09	
	Greateſt variation, - - - - -	00.19	00.17	00.14	
	Mean denſity, - - - - - - -	.732	.712	.723	722 Mean denſity.
HYGROMETER,	Moiſture and drought, - - -	30 d.	50 d.	40 d.	

Clear, - - - - - 29 days,
Cloudy, - - - - 2 ditto,

THE atmoſphere very dry and elaſtic.
THE winds variable, but from the middle of the month were almoſt conſtantly from the SW and S, and often pretty ſtrong.
THE mercury in the Barometer ſtood very high till about the end of the month, when a very ſenſible change took place, both with regard to the warmth and ſerenity of the weather; frequent heavy dews about the ſame time.
THE mornings always very foggy.
THE medium heat of the ſun at mid-day (the inſtrument being expoſed five minutes) was 90°

CALCUTTA, JANUARY 1785.

Day.	*Thermometer.* *M.*	*N.*	*E.*	*Mean denſity at each quarter of the Moon.*	*Barometer.* *M.*	*N.*	*E.*	*Hygrometer.* *M.* *d.*	*M.* *m.*	*N.* *d.*	*N.* *m*	*E.* *d.*	*E.* *m.*	*Rain.*	*Wind and Force.* *Point.*	*M.*	*N.*	*E.*	
1	60	69	64		30.09	30.09	30.09	30		50		45			WN	0	1	0	Clear,
2	57	69	64		.09	.09	.11	40		50		45			NW	0	1	0	ditto,
3	60	71	65		.11	.06	.07	25		45		40				0	1	0	ditto,
4	59	69	65	L. Q.	.04	.04	.09	30		50		40			WNW	0	1	0	ditto,
5	63	70	66	732	.10	.08	.08	35		50		40				0	2	0	ditto,
6	64	70	66		.07	.08	.12	30		50		40			W	0	2	0	ditto,
7	63	72	67		.13	.13	.17	35		55		50			NW	0	2	0	ditto,
8	59	72	67		.14	.13	.10	35		60		50			N	1	2	0	ditto,
9	58	73	65		.10	.09	.09	35		60		45			NW	1	2	0	ditto,
10	60	70	65		.10	.10	.14	40		60		50				0	1	0	ditto,
11	58	72	65	N. M.	.13	.10	.12	35		60		50				1	2	1	ditto,
12	59	72	65	736	.11	.11	.11	25		50		45			N	1	2	0	ditto,
13	60	72	66		.11	.11	.12	30		50		45			NW	2	1	0	ditto,
14	60	73	67		.12	.11	.13	40		45		45				0	1	0	ditto,
15	58	71	65		.14	.14	.14	35		50		50				1	2	0	ditto,
16	60	70	65		.15	.15	.17	40		55		50				0	2	0	ditto,
17	60	69	65	F. Q.	.17	.13	.10	45		55		50			N	1	1	0	ditto,
18	59	70	65	736	.10	.10	.06	40		55		50			NW	1	2	0	ditto,
19	60	70	65		.08	.05	.05	40		60		50				0	2	0	ditto,
20	58	71	65		.05	.05	.05	30		55		50				0	1	0	ditto,
21	64	74	67		.02	.00	.07	0		40		30			SW	0	1	0	ditto,
22	60	71	65		.08	.05	.08	40		55		50			W	1	2	0	ditto,
23	59	70	65		.04	.04	.05	40		60		55			SW	1	2	0	ditto,
24	62	70	66	F. M	.06	.04	.05	40		55		50			W	0	2	0	ditto,
25	62	75	68	728	.08	.06	.07	40		55		45				0	1	0	ditto,
26	63	74	69		.07	.01	.03	30		45		30			SW	0	2	0	ditto,
27	68	74	70		29.98	29.97	.03		15	40		30			S	0	2	0	ditto,
28	67	76	69		30.01	.98	.04	10		55			10		SW	1	2	0	ditto,
29	65	77	74		.02	30.01	.05	40		60		50			S	0	3	0	ditto,
30	66	76	71		.00	.01	.03	10		40			10			0	3	1	Cloudy,
31	70	78	74		.02	.03	.05		40	0			10			0	3	2	ditto,
mean	51½	72	56⅔		30.08	30.07	30.09	30	1¾	50		40	1		var.	⅓	2	⅛	Clear,

A GENERAL STATE *of the* WEATHER, *for* FEBRUARY 1785.

		M.	*N.*	*E.*	
THERMOMETER,	Greatest altitude, - - - - -	74	86	76	75 Mean temperature.
	Least ditto, - - - - - -	68	75	69	
	Mean ditto, - - - - - -	71	79½	74	
BAROMETER,	Greatest ditto, - - - - - -	30.14	30.17	30.15	30.02 Mean state of the atmosphere.
	Least ditto, - - - - - -	29.89	29.89	29.96	
	Mean ditto, - - - - - -	30.02	30.01	30.04	
	Greatest variation, - - - -	0.25	0.28	0.19	
	Mean density, - - - - - -	.713	.698	.708	.706
HYGROMETER,	Moisture and drought, - - -	0	28 d.	22 d.	

Clear - - - 17 days.
Cloudy, - - 11 ditto.
Rain, - - - - 4 ditto.
Quantity ditto, 2-9 inches.

THUNDER five times. Mean heat of the Sun at mid-day, the Thermometer being exposed five minutes, 96°.

THE beginning of this month the air was very moist, which is generally the case when the wind comes from the S and SE.

ON the contrary, the NW winds which prevailed, renders it very dry and elastic, and has always a very great effect in raising the mercury in the Barometer. During the whole of this month the mornings were extremely thick and foggy; on the 1st, 8th, and 12th, moderate storms from the NW.

CALCUTTA, FEBRUARY 1785.

Day.	Thermometer. M.	N.	E.	Mean density at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	M. m.	N. d.	N. m.	E. d.	E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	71	77	74		30.00	29.90	29.95		50	0	0		40	0.5	S	1	4	1	Cloudy,
2	73	76	71		29.89	.89	.96		40		15		20		SE	1	2	1	ditto,
3	69	77	73	L. Q.	.96	.96	30.03		30	25		20				0	1	0	Clear,
4	72	78	74	714	33.08	30.07	.12		30		5		30		S	0	1	0	Cloudy,
5	72	79	75		.08	.04	.04		4	15			25			0	1	1	Clear,
6	74	80	76		29.98	.03	.05		50	30			20			3	2	1	Cloudy,
7	72	80	72		.98	29.99	.04		45	35		0	0		SE	1	1	1	Clear,
8	75	80	73		30.05	30.04	.11		30		15		5	0.8	E	0	1	0	ditto,
9	68	78	74	N. M.	.07	.03	.03		35		15		5		W	1	1	0	Cloudy,
10	72	80	75	711	29.97	29.95	29.98		15	40		30			N	2	1	0	Clear,
11	70	80	74		.98	.99	30.03	10		60		55				1	1	0	ditto,
12	73	82	69		30.03	30.03	.12	30		30		40		1.1	NW	0	0	3	Cloudy,
13	69	79	72		.05	.00	.06	25		45		40				1	0	2	ditto,
14	69	81	74		.01	.00	.04	35		55		50			SW	1	1	0	Clear,
15	70	81	75		.04	.01	.04	30		45		45				0	1	0	ditto,
16	70	75	73	F. Q.	.07	.06	.08	35		55		50			NW	3	3	0	Cloudy,
17	69	80	73	717	.06	.02	.05	40		60		55			SW	0	1	1	Clear,
18	70	73	69		.02	.02	.04	35		30			5	0.7		0	2	1	Cloudy,
19	67	75	71		.03	.04	.03		15			15				0	2	1	ditto,
20	69	79	72		.03	.03	.03		10	25		20			NW	0	2	0	Clear,
21	69	77	73		.04	.04	.04	0		20		25			W	0	2	1	ditto,
22	70	82	75		29.98	29.97	29.97		10			15				0	1	1	ditto,
23	74	84	76		.99	.96	30.00		20	35		45				1	2	1	ditto,
24	72	82	75	F. M.	30.00	.98	29.98	35		55		45				0	1	0	ditto,
25	72	86	76	710	29.96	.96	.97	30		60		55			NW	0	1	0	Cloudy,
26	73	81	76		.96	.96	30.00	50		60		55			NW	1	1	0	Clear,
27	73	83	74		30.03	30.03	.10	50		60		55				0	1	0	ditto,
28	70	81	73		.14	.17	.15	50		60		55				0	1	0	ditto,
mean	71	79½	74		30.02	30.01	30.04	15	15	30	2	28	6	2.9		½	1⅓	½	

A General State *of the* Weather, *for* March 1785.

		M.	N.	E.	
Thermometer,	Greateſt altitude, - - - - -	80°	90°	83°	79°
	Leaſt ditto, - - - - - - -	68	80	73	
	Mean ditto, - - - - - - -	75	85	78	
Barometer,	Greateſt ditto, - - - - - -	30.12	30.10	30.13	29.95
	Leaſt ditto, - - - - - - -	29.85	29.84	29.86	
	Mean ditto, - - - - - - -	29.95	29.92	29.97	
	Greateſt variation, - - - - -	.27	.26	.27	
	Mean denſity, - - - - - -	.075	.688	.700	.698
Hygrometer,	Moiſture and drought, - - - -	0 .0	36 d.	18 d.	

Clear, - - - 20 days.
Cloudy, - - - 11 ditto.
Rain, - - - 3 ditto.
Quantity ditto, - 0-5 inches.

Thunder five times. Mean heat of the ſun 100°.

There were two or three thunder ſtorms this month, but gentle, and attended with very little rain. Several mornings about the beginning, were very foggy and damp, and continued ſo, but in a leſſer degree, nearly throughout the month. Heavy dews from the 15th.

The Barometer continued low, which may proceed from the high winds that prevailed, as well as from the extreme rarefaction of the atmoſphere at this ſeaſon of the year. We had often the appearance of rain, as muſt always be the caſe while the wind comes from the South quarter, and bringing with it ſo much vapour.

Calcutta, March 1785.

Day.	Thermometer. M.	N.	E.	Mean denſity at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	M. m.	N. d.	N. m.	E. d.	E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	68	84	73		30.12	30.10	30.13	55		60		60			NW	1	2	0	Clear,
2	68	84	73		.10	.07	.08	50		60		55				0	1	0	ditto,
3	69	80	74		.05	.04	.07	50		55		50			SW	0	2	1	ditto,
4	72	82	75	L. Q.	.04	.03	.06	25		50		50				1	2	2	ditto,
5	73	83	75	.713	.05	.04	.04		5	35		25			SE	0	3	1	ditto,
6	73	81	76		.03	29.98	.00		5	50		35				0	4	1	ditto,
7	73	82	77		29.97	.99	.04		0	55		40			S	0	4	1	ditto,
8	73	82	77		30.02	30.03	.07	20		45		40			SE	0	3	2	Cloudy,
9	73	87	77		.06	.04	.07	40		55		40			SW	1	2	0	Clear,
10	74	84	74		.05	.02	.05	25		50		45		0.1	SW	0	3	1	Cloudy,
11	71	83	76	N. M.	.02	29.98	.02	45		50		40			SE	0	2	1	Clear,
12	74	85	77	.709	29.98	.90	29.93	10		40		15				0	2	1	Cloudy,
13	75	84	75		.90	.84	.89			20		40		0.3		1	3	2	Clear,
14	71	84	74		.90	.88	.93	35		30		15		ſome hail.		0	3	1	Cloudy,
15	75	84	74		.90	.85	.93			40		20				1	4	3	ditto,
16	73	83	77		.87	.87	.97	10	20	20		20				3	4	4	ditto,
17	77	85	80	F. Q.	.90	.89	.97		10	25		0			S	1	1	1	ditto,
18	77	86	80	.702	.96	.88	.93		20	21		0	10		SW	0	2	1	Clear,
19	77	89	82		.92	.87	.92		25	50					SE	1	2	1	ditto,
20	78	90	83		.89	.85	.88		35	40		10			SW	0	2	2	ditto,
21	78	87	81		.86	.84	.87		20	20		10	10		SE	1	3	1	Cloudy,
22	79	86	81		.87	.87	.89		30	10			10		S	1	4	2	ditto,
23	79	85	81		.85	.84	.89		30	10				0.1		1	3	4	Clear,
24	77	85	80		.87	.85	.89		10	20						1	2	3	ditto,
25	78	87	81		.89	.92	.98		30	35						0	3	2	ditto,
26	79	86	81	F. M.	.96	.91	.91		30	20			10			0	3	3	Cloudy,
27	79	88	82	.696	.89	.93	.86		20	20						2	3	1	Clear,
28	79	88	82		.85	.87	.92		35	15			5			1	2	3	ditto,
29	79	88	83		.90	.87	.92		25	20			5			1	2	2	ditto,
30	80	84	82		.95	.87	.90		30	20			20			0	0	0	Cloudy,
31	79	88	82		.90	.85	.90	25		60		40				0	1	0	Clear,
mean	75	85	78		29.95	29.92	29.97	13	13	36		20	2	0.5	S	½	3	2	Clear,

A General State of the Weather, for April 1785.

		M.	N.	E.	
Thermometer,	Greatest altitude, - - - - -	83	91	85	
	Least ditto, - - - - - -	69	75	74	82½
	Mean ditto, - - - - - - -	79	86½	82	
Barometer,	Greatest ditto, - - - - - - -	29.97	29.92	29.97	
	Least ditto, - - - - - - -	29.70	29.68	29.74	
	Mean ditto, - - - - - - -	29.83	29.81	29.86	69.83
	Greatest variation, - - - -	.27	.24	.23	
	Mean density, - - - - - - -	.695	.684	.691	.690
Hygrometer,	Moisture and drought, - - -	20 m.	20 d.	4 d.	

Clear - - - 17 days.
Cloudy, - - 13 ditto.
Rain, - - - 6 ditto.
Quantity ditto, 8 inches.

The quantity of rain that fell on the 16th and 17th was very considerable, and the variation that appeared on the mercury before and after the thunder storms was very great, sometimes 00.30 in the space of a few minutes.

Thunder six times. Mean heat of the sun 108° to 110°.

The temperature of the air throughout this month was less warm and sultry than it is generally found at this time of the year, as also the storms that came from the NW were fewer in number. The air rather moist, and little or no variation in the winds, they being always directly S and SE.

Calcutta, April 1785.

Day.	Thermometer. M.	N.	E.	Mean density at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d	M. m.	N. d.	N. m.	E. d.	E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	79	84	80		29.90	29.86	29.90	30		55		50			S	0	2	2	Clear,
2	75	90	80		.89	.82	.85	25		60		30				0	1	2	ditto,
3	77	90	83	L. Q. .697	.82	.77	.81		20	60		30				1	3	2	ditto,
4	77	90	82		.82	.80	.84		10	45		20				0	1	3	ditto,
5	79	88	83		.83	.80	.83			45		30				0	3	1	ditto,
6	79	90	83		.81	.82	.83			35		25				0	3	3	ditto,
7	78	88	82		.86	.85	.88			20		20				1	4	3	ditto,
8	80	88	81		.88	.83	.84		15	30						0	4	4	Cloudy,
9	80	87	84	N. M.	.82	.81	.84		30	20		10				2	3	2	Clear,
10	80	87	84	.694	.78	.77	.85		30	40			10			1	4	1	Cloudy,
11	81	88	85		.83	.82	.86		25	50		15				1	2	3	ditto,
12	81	88	85		.82	.80	.87		30		10	35				1	0	1	ditto,
13	81	85	84		.82	.86	.89		25	30		35				1	0	0	ditto,
14	83	84	82		.87	.87	.89		10	40		40				1	4	0	ditto,
15	81	84	83		.90	.92	.97	20		30					NW	1	0	1	ditto,
16	78	81	74	F. Q.	.97	.92	.96	45			40		0	2.4		3	2	4	ditto,
17	69	75	75	.698	.86	.79	.83		30		20		50	3.6	NE	3	3	2	ditto,
18	77	82	80		.82	.88	.94		60	15			20	0.5	S	0	0	0	Clear,
19	79	84	82		.92	.84	.90		40							0	4	0	Cloudy,
20	78	85	81		.85	.79	.93		20							1	2	2	Clear,
21	75	84	80		.85	.83	.90		10							1	3	2	Cloudy,
22	74	82	80		.85	.84	.87		20		10		10	0.9		1	2	0	Clear,
23	79	85	83		.83	.80	.83		40		10		20		SE	1	2	1	Cloudy,
24	81	88	85	F. M.	.80	.75	.78		40	10			20			1	3	1	Clear,
25	82	89	85	.694	.77	.76	.84		40	20			10			1	2	1	ditto,
26	83	89	81		.76	.77	.87		30		10		10	0.3	S	1	4	4	Cloudy,
27	82	89	82		.72	.68	.83		40		20		20	0.3		3	4	4	ditto,
28	79	87	83		.70	.75	.74		40	20			30			1	3	3	ditto,
29	82	90	85		.76	.79	.84		50	10			15			0	3	1	ditto,
30	82	91	85		.82	.83	.84		40	10			15			1	3	1	ditto,
mean	79	86½	82		29.83	19.81	29.86	4	24	24	4	12	8	8.0	S	1	3	2	Cloudy.

A General State of the Weather, for May 1785.

		M.	N.	E.	
Thermometer,	Greatest altitude, - - - - -	87	94	89	86
	Least ditto, - - - - - - -	79	87	80	
	Mean ditto, - - - - - - -	83	$89\frac{2}{3}$	85	
Barometer,	Greatest ditto, - - - - - -	29.96	89.92	30.03	29.77
	Least ditto, - - - - - - -	29.60	29.53	29.63	
	Mean ditto, - - - - - - -	29.77	29.74	29.82	
	Greatest variation, - - - - -	.36	.39	.30	
Hygrometer,	Mean moisture, - - - - -	1 m.	30 d.	20 d.	.682
	Mean density, - - - - - -	.685	.676	.685	

Clear, - - - 16 days.
Cloudy, - - - 13 ditto.
Rain, - - - 10 times.
Quantity ditto, - 6 inches.

Thunder fourteen times. Mean heat of the sun 110° to 111°.

The air this month has been drier than that of the preceding, but the winds being more from the SE quarter is the reason of the mercury being so low; much close and sultry weather about the middle. The variation on the Barometer much greater than usual.

Calcutta, May 1785.

Day.	Thermometer. M.	N.	E.	Mean density at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	M. m.	N. d.	N. m.	E. d.	E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	82	92	86		29.82	29.80	29.81		40	10			10		S	1	2	1	Clear,
2	83	91	85		.77	.74	.75		30	10			10			2	2	2	ditto,
3	83	91	87	L. Q. .688	.75	.68	.75		30	20		20				1	1	2	ditto,
4	87	91	86		.76	.78	.83	15		40		20				6	3	1	ditto,
5	85	89	86		.78	.83	.87	0		30		20				1	4	4	Cloudy,
6	83	90	83		.96	.86	30.03	15		30		20		0.5		2	3	2	Clear,
7	81	87	84		.78	.78	29.94	10		35		30			E	1	2	1	Cloudy,
8	82	90	87	N. M. .690	.95	.92	.97		10	50		30			S	0	2	0	Clear,
9	83	90	85		.94	.89	.95		10	50		25				0	2	1	ditto,
10	83	89	85		.92	.85	.89	10		45		20		0.3	SE	0	2	0	ditto,
11	84	90	83		.86	.79	.83	10		50		30				0	2	2	ditto,
12	83	90	83		.80	.77	.85			50		15		0.1		1	2	2	ditto,
13	84	89	85		.80	.78	.83		10	45		35				3	3	0	ditto,
14	84	91	85		.83	.77	.82	25		50		30				0	1	0	Cloudy,
15	84	92	86		.84	.77	.80		10	60		55				0	1	0	Clear,
16	86	93	84		.81	.76	.86	40		60		55			SW	0	0	0	ditto,
17	82	92	85	F. Q. .688	.83	.81	.90	20		56		30				0	1	0	Cloudy,
18	80	88	84		.77	.86	.93		10	40		20		1.4	S	0	1	0	ditto,
19	81	88	86		.89	.81	.83	10		50		40			SW	1	0	0	Clear,
20	83	89	86		.80	.72	.79	10		50		40			S	0	0	0	Cloudy,
21	84	91	83		.75	.67	.79	10		55		40				0	1	1	Clear,
22	82	90	87		.74	.65	.75	30		40		40				0	1	0	Cloudy,
23	83	91	89		.69	.58	.66	10		40		35			SE	0	1	0	Clear,
24	87	94	89	F. M. .685	.63	.53	.66	20		20		20		0.2	S	0	0	4	Cloudy,
25	84	92	82		.60	.59	.63		10	60		10		1.3		1	0	0	ditto,
26	79	88	85		.65	.64	.70		10	50		20			SE	1	0	0	ditto,
27	84	90	80		.65	.64	.76		20	40			10	0.5		0	3	1	ditto,
28	82	88	85		.70	.70	.78		20	40			10			0	1	3	Clear,
29	81	88	82		.73	.70	.75	10		40		10		0.4	S	3	3	1	Cloudy,
30	84	90	85		.74	.66	.72		20	0				0.1		3	3	2	Clear,
31	83	87	85		.61	.68	.72		40		20		40	1.2	SW	2	1	1	Cloudy,
mean	83	$89\frac{2}{3}$	85		29.77	29.74	29.82	8	9	40	1	23	3	6.0		4	2	1	Clear.

A General State *of the* Weather, *for* June 1785.

		M.	N	E.	
Thermometer,	Greateſt altitude, - - - - -	84	90	85	82⅔
	Leaſt ditto, - - - - - - -	79	80	79	
	Mean ditto, - - - - - - -	81½	84½	82	
Barometer,	Greateſt ditto, - - - - - - -	29.70	29.68	29.72	29.58
	Leaſt ditto, - - - - - - -	29 44	29.40	29.47	
	Mean ditto, - - - - - - -	29 59	29.56	29.61	
	Greateſt variation, - - - - - -	.26	.28	.25	
	Mean denſity, - - - - - - -	.687	.681	.685	.684
Hygrometer,	Moiſture and drought, - - -	50 m.	30 m.	40 m	

Clear, - - - - - - 4 days.
Cloudy, - - - - - - 26 ditto.
Rain, - - - - - - 24 times.
Thunder, - - - - - 16 ditto.
Quantity of rain, - - 24 inches.

Mean heat of the Sun 106°.

The quantity of rain this month has been uncommonly great, and ſcarce a day paſſed without ſome falling; the weather of courſe diſagreeable and unhealthy.

The mercury in the Barometer very low, which ſeldom fails to be the caſe, while the winds come from the SE and E quarters.

Calcutta, June 1785.

Day.	Thermometer. M.	Thermometer. N.	Thermometer. E.	Mean denſity at each quarter of the Moon.	Barometer. M.	Barometer. N.	Barometer. E.	Hygrometer. M. d.	Hygrometer. M. m.	Hygrometer. N. d.	Hygrometer. N. m	Hygrometer. E. d	Hygrometer. E. m	Rain.	Wind and Force. Point.	M.	N	E.	
1	84	90	83		29.61	29.54	29 65		40		10		20	0.2	S	0	0	1	Cloudy,
2	83	85	82		.63	.61	.68		40		20		40		SE	1	1	0	ditto.
3	81	90	83		.68	.67	.70		45		0		20			0	1	1	Clear,
4	81	85	82		.70	.66	.72		40		40		50	0.7		1	0	0	Cloudy,
5	81	86	83		.70	.62	.64		40		30		40		NE	1	0	1	ditto,
6	81	85	83		.62	.55	.61		60		30		40	0.1	E	1	1	1	ditto,
7	82	85	82	N. M.	.59	.61	.69		50		50		50	0.1		1	1	0	ditto,
8	82	84	80	.687	.64	.60	.68		60		60		60	0.5	SE	1	0	0	ditto,
9	80	80	82		.68	.65	.70		60		60		60	2.7		0	1	1	ditto,
10	80	84	84		.57	.64	.68		60		40		60	1.5	S	0	1	0	Clear,
11	82	84	84		.67	.64	.70		60		20		50	0.1		0	0	1	Cloudy,
12	82	87	84		.70	.68	.70		50		10		30			0	1	0	Clear,
13	84	87	85		.62	.68	.58		30		30		30			0	1	0	ditto,
14	83	87	81		.56	.46	.50		50		30		30	0.2		0	1	0	Cloudy,
15	84	84	82	F Q.	.44	.40	.47		50		50		40	2.9	SE	0	0	2	ditto,
16	81	84	80	.681	.48	.49	.57		60		50		50	1.7		0	1	0	ditto,
17	82	83	80		.54	.58	.65		60		60		50	1.4	E	0	1	0	ditto,
18	79	82	79		.63	.62	.66		60		60		60	2.9	SE	0	1	0	ditto,
19	80	82	80		.58	.56	.60		60		40		60	1.3		1	2	1	ditto,
20	80	82	81		.57	.54	.62		60		40		50	0.2		2	1	1	ditto,
21	79	83	82		.57	.54	.60		50		40		40	0.3		0	1	0	ditto,
22	81	84	82	F. M	.57	.55	.57		40		40		50	N		0	1	1	ditto,
23	81	82	80	.687	.55	.55	.59		50		30		60	5.9		0	0	0	ditto,
24	80	84	82		.56	.52	.58		50		30		40	0.1		1	1	0	ditto,
25	82	85	83		.53	.52	.57		50		30		40	N		1	1	2	ditto,
26	82	85	83		.52	.52	.55		50		30		40	0.1		1	0	0	ditto,
27	83	85	84		.47	.48	.54		50		30		40	0.1		0	0	1	ditto,
28	82	84	83	L. Q.	.35	.45	.50		50		30		40	0.6		1	0	0	ditto,
29	82	85	84	.681	.48	.44	.48		50		30		40			0	2	0	ditto,
30	82	85	84		.46	.45	.49		50		30		40	0.8	NE	0	1	0	ditto,
mean	81½	84½	82		29.59	29.56	29.61		50		30		40	24.4		½	¾	½	Cloudy.

A General State *of the* Weather, *for* July 1785.

		M.	N.	E.	
Thermometer,	*Greatest altitude* - - - - -	84°	89	87	$82\frac{2}{3}$
	Least ditto, - - - - - -	79	80	80	
	Mean ditto, - - - - - -	$81\frac{1}{3}$	$84\frac{1}{2}$	$82\frac{1}{3}$	
Barometer,	Greatest ditto, - - - - - -	29.73	29.67	29.73	29.59
	Least ditto, - - - - - -	29.44	29.45	29.47	
	Mean ditto, - - - - - -	29.59	29.56	29.62	
	Greatest variation, - - - - -	.29	.22	.26	
	Mean density, - - - - - -	.686	.681	.989	. 84
Hygrometer,	Mean moisture, - - - - -	50 m.	35 m.	45 m.	

Clear, - - - - - -	4	days.
Cloudy, - - - - - -	27	ditto.
Rain, - - - - - -	24	times.
Quantity of ditto, - -	12-8	inches.
Thunder, - - - - -	11	times.

Mean heat of exposed air 100°.

The weather this, as the preceding month, very relaxing and disagreeable, although the quantity of rain only about one half. The low state of the mercury is undoubtedly affected by the Easterly winds, as is no less the animal spirits.

Calcutta, July 1785.

Day.	*Thermometer.* M.	N.	E.	*Mean density at each quarter of the Moon.*	*Barometer.* M.	N.	E.	*Hygrometer.* M. (d. m.)	N. (d. m.)	E. (d. m.)	Rain.	*Wind and Force.* Point.	M.	N.	E.	
1	82	86	85		29.47	29.46	29.52	40	20	40	0.1	SE	0	0	0	Cloudy,
2	80	80	83		.51	.50	.58	40	30	40	0.3	NE	1	1	2	ditto,
3	79	83	81		.52	.53	.57	50	30	50	0.2		1	0	3	ditto,
4	80	84	81		.56	.54	.60	60	40	0	2.6	S	0	1	0	ditto,
5	82	82	81		.58	.54	.59	60	50	60	0.3	S	0	0	0	ditto,
6	81	80	80	N. M. 684	.54	.45	.47	60	60	60	2.6	SE	0	0	3	ditto,
7	79	83	81		.44	.47	.57	60	60	60	0.1	SW	0	2	2	ditto,
8	80	82	80		.54	.57	.63	60	60	60	0.4	SE	0	1	1	ditto,
9	80	84	81		.60	.59	.66	60	60	60		S	1	1	1	ditto,
10	80	85	83		.66	.63	.70	60	20	40			0	1	1	ditto,
11	82	84	82		.68	.66	.70	60	30	40	R		0	0	1	ditto,
12	81	85	83		.66	.57	.58	50	30	40	1.3	SE	0	1	2	ditto,
13	83	83	82		.55	.48	.54	50	40	50	1.7		0	1	0	ditto,
14	81	83	81	F. Q. 686	.52	.51	.62	50	40	50	0.1	SE	1	1	3	ditto,
15	80	84	83		.63	.63	.68	50	20	30		SW	2	2	2	ditto,
16	82	85	83		.67	.60	.64	50	30	40	0.3	S	2	1	2	ditto,
17	82	86	84		.62	.57	.57	50	20	30	0.2	S	1	1	4	Clear,
18	82	83	81		.52	.49	.50	50	30	40	0.5	SW	1	2	3	Cloudy,
19	80	84	80		.47	.50	.57	50	20	40	0.6	SE	1	1	0	ditto,
20	80	83	82		.55	.54	.60	50	30	40	0.6	SW	0	0	1	ditto,
21	81	84	82		.57	.55	.63	50	30	40		S	0	1	1	ditto,
22	81	83	81	F. M. 687	.60	.62	.66	50	40	40	0.1	SE	0	0	0	ditto,
23	80	84	81		.66	.64	.72	50	40	30	0.1		1	1	0	ditto,
24	80	85	83		.72	.67	.73	50	40	20	R		1	2	0	ditto,
25	83	87	85		.73	.67	.69	25	30	10		S	1	1	0	Clear,
26	84	87	84		.72	.67	.72	30	30	10	0.1	SE	0	0	1	ditto,
27	84	86	84		.70	.63	.67	10	10	20		S	0	0	0	Cloudy,
28	84	85	84	L. Q. 688	.67	.60	.64	30	0	0	0.3	SE	0	2	1	ditto,
29	84	89	87		.64	.58	.66	40	0	20			0	1	0	Clear,
30	84	87	85		.60	.56	.60	40	20	20	0.1		0	1	0	Cloudy,
31	82	86	84		.57	.46	.65	40	10	20	0.1		1	0	1	ditto,
mean	$81\frac{1}{3}$	$84\frac{1}{3}$	$82\frac{1}{3}$		29.59	29.56	29.62	50	35	45	12.8		$\frac{1}{2}$	1	1	Cloudy.

A General State *of the* Weather, *for* August 1785.

		M.	N.	E.	
Thermometer,	Greateſt altitude, - - - - -	84	89	86	
	Leaſt ditto, - - - - - - -	79	80	80	82¾
	Mean ditto, - - - - - - - -	81½	84½	82½	
Barometer,	Greateſt ditto, - - - - - -	29.78	29.72	29.78	
	Leaſt ditto, - - - - - - -	29.50	29.49	29.57	29.62
	Mean ditto, - - - - - - - -	29.62	29.59	29.64	
	Greateſt variation, - - - - -	.28	.23	.21	
	Mean denſity, - - - - - - -	.687	.682	.686	.685
Hygrometer,	Moiſture, - - - - - - - -	50 m	30 m	40 m	

Clear, - - - 3 days.
Cloudy, - - - 28 ditto.
Thunder, - - 16 times.
Rain, - - - 20 ditto.
Quantity ditto, - 9-3 inches.

The heat of the ſun at mid-day 100°.

Much cloudy weather, but ſeldom any very heavy falls of rain, and the quantity altogether but moderate. The river very full, and accounts of heavy rains up the conntry.

The Barometer remarkably low the whole month; a proof of there being ſtill much water in the Clouds.

Calcutta, August 1785.

Day.	Thermometer. M.	Thermometer. N.	Thermometer. E.	Mean denſity at each quarter of the Moon.	Barometer. M.	Barometer. N.	Barometer. E.	Hygrometer. M. (d. m.)	Hygrometer. N. (d. m.)	Hygrometer. E. (d. m.)	Rain.	Wind and Force. Point.	M.	N.	E.	
1	80	84	82		22.53	29.50	29.58	50	40	40	0.3	SE	0	1	1	Cloudy,
2	81	86	83		.56	.53	.60	50	30	20			0	1	0	Clear,
3	83	84	83		.59	.56	.63	50	20	30			0	1	0	Cloudy,
4	83	87	85	N. M. 685	.60	.55	.60	40	20	20	0.1		1	1	0	ditto,
5	81	83	81		.59	.58	.61	40	40	40	1.3		1	1	0	ditto,
6	80	83	81		.56	.54	.60	50	40	50	0.9		1	1	1	ditto,
7	81	84	81		.58	.56	.65	60	40	50	0.2		0	1	0	ditto,
8	80	82	81		.63	.62	.74	60	50	50	1.2		0	1	1	ditto,
9	70	80	80		.74	.74	.76	60	60	50	0.1		0	0	1	ditto,
10	79	84	82		.74	.68	.70	60	50	50			0	1	1	ditto,
11	82	87	85		.65	.59	.62	60	30	50			0	0	1	Clear,
12	82	85	83	F. Q. 686	.60	.61	.64	50	30	40			0	1	1	Cloudy,
13	81	83	82		.63	.60	.64	50	40	30			0	0	0	ditto,
14	81	85	84		.58	.50	.57	50	30	40	0.3		0	1	1	ditto,
15	83	86	84		.53	.49	.57	50	40	30	0.4		0	1	0	ditto,
16	82	83	82		.54	.53	.57	50	30	20	0.5	NE	1	1	2	ditto,
17	82	84	82		.50	.54	.62	50	20	30	0.2	SE	1	1	1	ditto,
18	83	84	83		.62	.58	.64	50	30	40	1.3		1	1	1	ditto,
19	84	87	85		.60	.58	.63	50	20	30			0	1	2	ditto,
20	80	89	86	F. M. 687	.58	.60	.66	40	0	0		NE	0	1	1	Clear,
21	84	85	85		.62	.60	.67	20	20	20		SE	0	1	0	Cloudy,
22	83	87	84		.62	.57	.64	30	10	20	0.2		4	1	1	ditto,
23	83	85	83		.61	.60	.60	40	30	30	0.1		1	1	1	ditto,
24	81	85	82		.63	.63	.70	40	30	30	0.3	NE	1	1	1	ditto,
25	82	85	84		.68	.67	.72	40	30	40			1	1	0	ditto,
26	81	84	81		.70	.66	.71	40	30	40	0.3		0	0	2	ditto,
27	80	84	81	L. Q. 690	.73	.70	.78	40	30	30	0.1		0	0	1	ditto,
28	81	85	83		.78	.72	.78	40	20	30	0.1		0	0	1	ditto,
29	81	85	83		.74	.67	.76	50	20	30		SE	0	0	1	ditto,
30	82	84	83		.70	.67	.73	40	20	30	0.1		0	0	0	ditto,
31	82	83	82		.67	.62	.69	30	30	30	1.4		1	1	1	ditto,
mean	81½	84½	82½		29.62	29.59	29.64	50	30	40	9.3	SE	½	1	1	Cloudy,

A General State *of the* Weather, *for* September 1785.

		M.	N.	E.	
Thermometer,	Greatest altitude, - - - - -	84°	89°	85	
	Least ditto, - - - - - -	80	81	80	82⅔
	Mean ditto, - - - - - -	81	85	82½	
Barometer,	Greatest ditto, - - - - - -	29.83	29.82	29.87	
	Least ditto, - - - - - -	29.62	29.59	29.66	29.71
	Mean ditto, - - - - - -	29.71	29.68	29.75	
	Greatest variation, - - - - -	.21	.23	.21	
Hygrometer,	Moisture, - - - - - - -	45 m	20 m.	25 m	.686
	Density, - - - - - - -	.687	.682	.688	

Clear, - - - - - 8 days.
Cloudy, - - - - - 22 ditto.
Rain, - - - - - 16 times.
Thunder, - - - - 13 ditto.
Quantity of rain, - 11-7 inches.

Mean heat of the sun at mid-day 110°.

The Barometer higher than the former month; about the middle and end, great quantities of rain. By accounts from Berhampore, the quantity of rain there must have been very considerable, and many parts above, the whole country being under water, and the river swelling prodigiously. This month very unhealthy and many people dying.

Calcutta, September 1785.

Day.	Thermometer. M.	N.	E.	Mean density at each quarter of the Moon.	Barometer. M.	N.	E.	Hygrometer. M. d.	m.	N. d.	m.	E. d.	m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	80	84	82		29.65	29.64	29.74		40		20		20		NE	2	2	2	Cloudy,
2	80	83	81		.70	.69	.77		30		20		30	0.2		1	1	1	ditto,
3	80	85	83	N. M.	.75	.74	.82		50		20		20			1	1	1	Clear,
4	81	87	85	692	.77	.73	.80		40		10		20		SE	0	1	0	ditto,
5	82	88	85		.78	.76	.84		30	10		10				0	1	0	ditto,
6	83	89	85		.80	.74	.80		30	20		0	0			0	1	0	ditto,
7	84	88	85		.76	.73	.77		20	20		10				1	0	0	ditto,
8	82	89	85		.77	.73	.80		30	10		10				1	1	0	ditto,
9	84	87	85		.80	.76	.85		20	10		0	0			0	1	0	Cloudy,
10	83	85	83	F. Q.	.83	.82	.87		20		10	0	0			0	1	0	ditto,
11	83	84	82	688	.82	.77	.80		40		20		30	0.5	E	0	1	0	ditto,
12	82	86	83		.97	.68	.73		40		20		20	0.3		1	0	1	ditto,
13	82	88	83		.68	.63	.70		40		20		20	0.6		0	0	1	ditto,
14	82	84	82		.66	.62	.69		40		20		20		NE	0	1	0	Clear,
15	81	87	83		.64	.60	.68		40		30		20			0	1	0	Cloudy,
16	81	85	83		.66	.64	.72		40		30		20	0.4	E	2	1	0	Clear,
17	81	84	81		.67	.66	.73		50		40		20	0.8	NE	2	1	1	Cloudy,
18	80	83	82	F. M	.68	.64	.70		50		40		40	0.3		2	1	2	ditto,
19	81	84	81	688	.62	.59	.66		50		40		50	0.3	SE	2	1	1	ditto,
20	80	84	80		.62	.60	.70		50		40		50	1.4		1	0	1	ditto,
21	80	82	81		.68	.72	.78		50		40		50	0.5		1	2	2	ditto,
22	80	82	81		.78	.77	.80		50		30		0	0.1		3	2	2	ditto,
23	81	87	85		.78	.72	.74		40		40		20		E	1	1	0	ditto,
24	84	87	85		.72	.66	.70		20		10		10			0	0	0	Clear,
25	83	86	82	L. Q.	.66	.62	.70		20		0		10			0	0	0	Cloudy,
26	81	83	80	686	.66	.64	.72		20		20		10	1.3	SE	1	2	2	ditto,
27	80	83	81		.66	.63	.68		30		20		20	1.7		1	1	2	ditto,
28	80	81	80		.62	.60	.67		50		50		30	0.6		1	2	2	ditto,
29	80	84	81		.66	.66	.72		50		50		50	3.5		2	2	3	ditto,
30	80	85	83		.70	.73	.78		50		20		20	0.2		0	1	1	ditto,
mean	81	85	82½		29.71	29.68	29.75		45	2	20	1	25	11.7	SE	1	1	1	

A GENERAL STATE *of the* WEATHER, *for* OCTOBER 1785.

		M.	*N*	*E.*	
THERMOMETER,	Greateſt altitude - - - - -	84	88	85	
	Leaſt ditto, - - - - - -	77	82	79	.83
	Mean ditto, - - - - - -	81	$85\frac{1}{2}$	$82\frac{2}{3}$	
BAROMETER,	Greateſt ditto, - - - - - -	29.98	29.96	29.98	
	Leaſt ditto, - - - - - -	22.83	29.81	29.85	29.91
	Mean ditto, - - - - - -	29.90	29.87	29.96	
	Greateſt variation, - - - - -	.15	.15	.13	
HYGROMETER,		5 d.	24 d.	7 d.	.691
	Mean denſity, - - - - - -	.694	.684	.692	

Clear, - - - - -	21	days.
Cloudy, - - - - -	10	ditto.
Thunder, - - - -	4	times.
Rain, - - - - -	7	times.
Quantity of ditto, - -	1-4	inches.

THE mean heat of the ſun at mid-day 110°.
THE wind began to ſet in from the NW about the 12th and 13th.

CALCUTTA, OCTOBER 1785.

Day.	*Thermometer.* M.	*Thermometer.* N.	*Thermometer.* E.	*Mean denſity at each quarter of the Moon.*	*Barometer.* M.	*Barometer.* N.	*Barometer.* E.	*Hygrometer.* M. d.	*Hygrometer.* M. m.	*Hygrometer.* N. d.	*Hygrometer.* N. m.	*Hygrometer.* E. d.	*Hygrometer.* E. m.	*Rain.*	*Wind and Force.* Point.	*Wind and Force.* M.	*Wind and Force.* N.	*Wind and Force.* E.	
1	83	85	84		29.84	29.80	29.85		30	20		10			NE	0	0	0	Clear,
2	81	85	83		.83	.82	.85		10	40		30				0	0	0	ditto,
3	83	87	85		.83	.81	.86	10		30		10				0	0	0	ditto,
4	82	87	84	N. M.	.85	.85	.90	10		40		10				0	0	1	ditto,
5	82	87	84	691	.88	.86	.93		0	30		0				0	0	0	ditto,
6	84	88	85		.95	.88	.92		10	10		0				0	0	0	ditto,
7	83	87	85		.90	.82	.90		0	10		0				0	0	1	ditto,
8	82	85	81		.88	.82	.90		0	10		0		0.1		1	1	1	Cloudy,
9	81	82	80		.88	.85	.91		10	0			10	0.6		1	2	2	ditto,
10	78	84	81		.91	.88	.96		10	30			10			1	1	1	ditto,
11	81	85	83	F. Q.	.96	.90	.94		10	20		10		0.1		0	1	0	Clear,
12	83	87	82	695	.94	.90	.96		0	30		10			NW	0	1	1	ditto,
13	82	87	85		.95	.90	.96		0	40		20				0	1	0	ditto,
14	83	88	85		.95	.89	.93	10		40		10				0	1	1	ditto,
15	84	88	84		.93	.91	.98		0	40		20				0	1	0	ditto,
16	83	85	85		.98	.93	.96		0	10		0				0	1	1	ditto,
17	83	87	84	F. M.	.97	.92	.93		10	40		10				1	1	0	ditto,
18	81	88	85	693	.93	.89	.93		0	30		20				1	1	0	ditto,
19	82	88	83		.92	.96	.94		0	30		20				0	1	1	ditto,
20	81	85	83		.90	.84	.96	10		50		30				1	1	1	ditto,
21	81	86	83		.90	.88	.91	20		50		30				0	1	0	ditto,
22	79	87	82		.92	.84	.89	10		50		20				0	1	1	ditto,
23	79	86	82		.91	.87	.93	10		50		30				0	1	0	ditto,
24	80	85	83		.92	.90	.95	20		40		20				1	0	0	ditto,
25	79	86	84	L. Q.	.94	.90	.94		0	30		20				0	1	0	ditto,
26	79	83	79	698	.90	.88	.90		0	20			10	0.2	SW	0	2	2	Cloudy,
27	79	82	80		.86	.82	.88		30		10		20	R	NE	0	2	1	ditto,
28	78	82	79		.87	.84	.88		30		0		20			0	2	1	ditto,
29	77	82	79		.85	.82	.92		30		10		10			0	2	2	ditto,
30	78	82	79		.90	.86	.92		30		10		10	0.3	NW	0	1	0	ditto,
31	87	82	80		.92	.90	.95		30				10	0.1	NE	0	0	0	ditto,
mean	81	$85\frac{1}{2}$	$82\frac{2}{3}$		29.90	29.87	29.9[illegible]	3	8	25	1	10	3	1.4	NW	$\frac{1}{3}$	1	$\frac{2}{3}$	Clear.

A General State *of the* Weather, *for* November 1785.

		M.	N.	E.	
Thermometer,	Greateſt altitude, - - - - -	80	85	82	75
	Leaſt ditto, - - - - - -	67	74	71	
	Mean ditto, - - - - - -	73	78½	75	
Barometer,	Greateſt ditto, - - - - - -	30.10	30.08	30.12	29.98
	Leaſt ditto, - - - - - -	29.90	29.82	29.80	
	Mean ditto, - - - - - -	29.99	29.98	30.80	
	Greateſt variation, - - - -	.20	.26	.32	
Hygrometer,		15 d	25 d.	20 d.	.705
	Mean denſity, - - - - - -	.709	.700	.706	

Clear - - - 26 days.
Cloudy, - - 4 ditto.
Rain, - - - 4 times.
Quantity ditto, 0-5 inches.

Mean heat of the ſun at mid-day 100°.

Calcutta, November 1785.

Day.	Thermometer. M.	Thermometer. N.	Thermometer. E.	Mean denſity at each quarter of the Moon.	Barometer. M.	Barometer. N.	Barometer. E.	Hygrometer. M. d.	Hygrometer. M. m.	Hygrometer. N. d.	Hygrometer. N. m.	Hygrometer. E. d.	Hygrometer. E. m.	Rain.	Wind and Force. Point.	M.	N.	E.	
1	79	85	82		29.93	29.90	29.96		20	10			10		NW	0	2	0	Clear,
2	80	85	82		.95	.93	30.00		20	10			10		NE	0	2	0	ditto,
3	80	84	80	N. M.	.93	.97	29.96		20	20				R	NE	0	2	0	ditto,
4	79	81	79	696	.94	.87	.92		20				10			1	1	2	ditto,
5	77	81	79		.90	.82	.87		20				20	R		2	2	1	ditto,
6	79	82	79		.88	.85	.80		30				10			0	2	0	ditto,
7	78	81	80		.93	.90	.97		30		30			0.4		0	1	1	Cloudy,
8	77	77	75		.93	.90	.93		30		30		30			1	2	3	ditto,
9	73	76	74	F. Q.	.90	.92	.97		10		10		30		NW	1	1	0	Clear,
10	73	79	77	706	.94	.94	0.03		30	20		10				0	1	0	ditto,
11	73	80	77		30.04	30.00	.10			30		20				0	1	0	ditto,
12	75	80	76		.10	.04	.07			0		20				0	1	0	ditto,
13	74	79	75		.08	.08	.12	10		40		30				0	1	1	ditto,
14	72	77	75		.08	.03	.09	20		40		30				0	1	0	ditto,
15	72	77	75		.00	29.96	29.98	30		50		30				0	1	0	ditto,
16	72	77	75	F. M.	29.90	.93	.95	40		50		30				0	1	0	ditto,
17	73	79	76	710	.96	.96	30.00	40		50		40				0	1	0	ditto,
18	74	79	76		30.02	30.02	.06	30		40		30				0	1	0	ditto,
19	73	78	74		.06	.03	.07	30		40		30				2	0	1	ditto,
20	71	77	75		.10	.04	.11	30		40		30				1	1	1	ditto,
21	71	77	73		.07	.04	.10	10		20		10		0.1		1	2	1	Cloudy,
22	69	79	74		.05	.02	.04	10		20		10				2	2	0	Clear,
23	71	77	75	L. Q.	.01	29.94	29.97	10		20		10				0	1	1	ditto,
24	73	77	74	712	29.98	.93	.94	20		40		20				1	1	1	ditto,
25	71	77	74		.93	.90	.96	40		50		40				2	1	1	ditto,
26	71	77	72		.94	.92	.98	40		50		40				1	1	1	ditto,
27	70	75	72		30.02	30.02	30.06	40		50		40				1	1	1	ditto,
28	68	74	71		.05	.00	.05	40		50		40				1	1	1	ditto,
29	67	74	71		.05	29.97	.02	40		50		40				0	2	1	ditto,
30	67	74	72		.02	.94	.00	40		50		40				0	1	0	ditto,
mean	73	78½	75		29.99	29.98	30.00	20	7	25	1	20	3	0.5	WW	½	1½	⅔	Clear.

A GENERAL STATE of the WEATHER, for DECEMBER 1785.

		M.	N.	E.	
THERMOMETER,	Greateſt altitude - - - - -	70	76	73	
	Leaſt ditto, - - - - - -	63	71	66	.69
	Mean ditto, - - - - - -	65¼	73½	69	
BAROMETER,	Greateſt ditto, - - - - - -	30.09	30.06	30.10	
	Leaſt ditto, - - - - - -	29.97	29.90	29.99	30.01
	Mean ditto, - - - - - -	30.02	29.98	30.03	
	Greateſt variation, - - - - -	.12	.16	.11	
HYGROMETER,		30 d.	50 d.	40 d.	.716
	Mean denſity, - - - - - -	.721	.709	.719	

Clear, - - - - - - 31 days.

THE weather throughout the month remarkably clear and pleaſant, and much milder than it is uſually at this ſeaſon of the year.

MEAN heat of the ſun at mid-day about 96°.

CALCUTTA, DECEMBER 1785.

Day.	Thermometer.			Mean denſity at each quarter of the Moon.	Barometer.			Hygrometer.						Rain.	Wind and Force.				
	M.	N.	E.		M.	N.	E.	M. d.	M. m.	N. d.	N. m.	E. d.	E. m.		Point.	M.	N.	E.	
1	68	76	78		30.00	29.97	29.99	30		50		40		NW	WW	1	1	0	Clear,
2	70	75	72.	N. M.	29.99	.95	30.00	30		50		40				0	1	0	ditto,
3	70	75	72	714	30.03	.98	.02	30		50		40				0	2	0	ditto,
4	69	75	72		.04	.98	.03	30		50		40				0	0	0	ditto,
5	68	75	71		.01	.96	.00	30		50		40				1	1	1	ditto,
6	67	75	71		29.98	.95	29.99	25		45		45				0	1	0	ditto,
7	67	74	71		.99	.96	.99	25		45		35				1	1	1	ditto,
8	67	74	69		.99	.99	30.04	30		45		35				0	1	1	ditto,
9	67	74	69	F. Q.	30.06	.99	.05	30		40		35				0	1	1	ditto,
10	67	74	69	720	.05	.97	.04	35		45		40				0	1	0	ditto,
11	67	75	70		.05	.94	.10	30		50		40				1	1	0	ditto,
12	68	75	70		.08	.99	.08	30		55		40				0	1	1	ditto,
13	66	75	70		.09	30.05	.08	30		55		40				0	2	1	ditto,
14	64	74	68		.06	.04	.09	30		55		45				0	1	0	ditto,
15	63	71	66	F. M.	.07	.03	.09	30		60		45				1	1	1	ditto,
16	63	71	67	728	.08	.02	.05	30		55		40				1	1	0	ditto,
17	63	72	67		.04	.02	.04	25		35		40				0	1	1	ditto,
18	66	73	67		.03	.00	.02	25		35		40				0	1	1	ditto,
19	64	73	68		.00	.00	.01	25		40		30				1	1	0	ditto,
20	63	73	69		29.97	29.97	.05	30		40		40				1	1	1	ditto,
21	65	73	69		30.02	.98	.02	30		50		45				0	1	1	ditto,
22	65	74	69		.00	.98	.03	35		40		30				0	1	0	ditto,
23	66	73	69	L. Q.	.05	.97	.03	35		40		30				0	1	0	ditto,
24	67	74	68	722	.03	.91	.06	35		45		35				0	1	1	ditto,
25	65	73	67		.04	.90	.02	30		45		40				0	1	1	ditto,
26	64	73	67		.00	.96	.00	30		50		40				1	1	0	ditto,
27	63	72	68		29.99	.95	.00	30		55		45				0	1	1	ditto,
28	64	73	68		.98	.97	.01	30		55		50				1	1	1	ditto,
29	64	73	67		.99	.97	.04	30		55		45				0	1	0	ditto,
30	64	73	8	N. M.	30.06	30.04	.07	30		50		40				0	1	1	ditto
31	63	74	67	728	.07	.06	.09	30		50		40				0	1	0	ditto,
Mean	63¾	73½	69		30.02	29.98	30.03	30		50		40				½	1	⅔	

FROM the foregoing DIARY of the Weather, it may be remarked, in regard to the variation of the Barometer, that, during the cold ſeaſon, from November to March, the mercury is at its greateſt height, and at the loweſt during the rainy months May, June, July, Auguſt, and September. The variation of the Thermometer, or the difference between the temperature of mid-day and that of the morning and evening is very trifling, ſeldom exceeding 3 or 4° during the rains; whereas, during the cold ſeaſon, the difference is 8 or 10°.

ABSTRACT *of a* METEOROLOGICAL REGISTER, *kept at* Calcutta, 1784.

MONTH.	Thermometer. Morning. Lowest.	Thermometer. Morning. Highest.	Thermometer. Morning. Mean.	Thermometer. Noon. Lowest.	Thermometer. Noon. Highest.	Thermometer. Noon. Mean.	Thermometer. Evening. Lowest.	Thermometer. Evening. Highest.	Thermometer. Evening. Mean.	Difference between morn. & mid-day heat.	Barometer. Morning. Lowest.	Barometer. Morning. Highest.	Barometer. Morning. Mean.	Barometer. Morning. Variation	Barometer. Noon. Lowest.	Barometer. Noon. Highest.	Barometer. Noon. Mean.	Barometer. Noon. Variation.	Barometer. Evening. Lowest.	Barometer. Evening. Highest.	Barometer. Evening. Mean.	Barometer. Evening. Variation.	Mean state atmosphere. Temperature	Mean state atmosphere. Weight.	Mean state atmosphere. Density.	Moisture. Moisture.	Moisture. Rainy days.	Moisture. Quantity rain.	Appearance atmosphere. Number clear days.	Appearance atmosphere. Cloudy ditto.	Thunder No. of times.	Winds. Point.	Winds. Force.
February,	66	75	72	70	86	79	68	76	73	7													74$\frac{2}{3}$		700	6	8	4.2	3	26	6	S	2
March,	66	84	75	75	89	84	71	85	79	9													79$\frac{3}{4}$		692	5	3	1.8	16	15	3	S	3
April,	71	86	83	87	97	91	79	87	85	8													86$\frac{1}{3}$		681	10	6	3.1	14	16	6	S	4
May,	75	85	81	82	93	89	74	88	84	8													84$\frac{2}{3}$		683	15	12	9.6	7	24	13	S	2
June,	77	84	81	80	90	85	78	86	83	4													83		686	25	14	17.4	1	29	5	SE	1
July,	77	84	81	77	90	85	78	85	83	4													83		686	25	20	15.	1	30	5	S&SE	1
August,	77	83	81	80	89	85	80	84	82	4	29.57	29.75	29.67	.18	29.56	29.75	29.66	.19	29.61	29.76	29.70	.15	82$\frac{2}{3}$	29.67	686	25	23	16.9	5	26	15	S&SE	1
September,	76	84	80	77	90	85	78	85	81$\frac{1}{2}$	5	.72	.95	.81	.23	.68	.90	.80	.22	.75	.97	.83	.22	82$\frac{1}{3}$	.81	690	24	12	11.3	10	20	5	S&SE	1
October,	74	83	79	77	90	86	76	85	82	7	.74	30.04	.92	.30	.77	30.00	.91	.23	.76	30.02	.92	.26	82$\frac{2}{3}$	.91	692	2	3	.8	19	12	1	NW	1
November,	66	78	71	76	86	81	71	80	75	10	.60	.12	30.00	.52	.88	.05	.99	.17	.92	.08	30.02	.16	76	30.00	702		1	.9	23	7		NW	1
December,	58	69	63	68	79	74	65	73	68	11	30.02	.17	.09	.15	30.00	.14	30.07	.14	30.02	.17	.09	.15	68$\frac{2}{3}$	.08	718		1	.05	26	5		NW	1
Jan. 1785.	57	70	61	69	78	72	64	74	66$\frac{1}{2}$	11	29.98	.17	.08	.19	29.97	.14	.07	.17	.03	.17	.09	.14	66$\frac{2}{3}$	.08	722				29	2		SW	2
Mean.	70	80$\frac{5}{12}$	75$\frac{8}{12}$	76$\frac{6}{12}$	88	83	73$\frac{6}{12}$	82[illegible]	78$\frac{4}{12}$	7$\frac{4}{12}$	29.77	30.03	29.93	.26	29.81	30.00	29.92	.19	29.85	30.03	29.94	.18	79	29.92	695		105	81.0	154	212	50		2

ABSTRACT *of a* METEOROLOGICAL REGISTER, *kept at* Calcutta, 1785.

MONTH.	Thermometer. Morning. Lowest.	Thermometer. Morning. Highest.	Thermometer. Morning. Mean.	Thermometer. Noon. Lowest.	Thermometer. Noon. Highest.	Thermometer. Noon. Mean.	Thermometer. Evening. Lowest.	Thermometer. Evening. Highest.	Thermometer. Evening. Mean.	Difference between morn. & mid-day heat.	Barometer. Morning. Lowest.	Barometer. Morning. Highest.	Barometer. Morning. Mean.	Barometer. Morning. Utmost variation.	Barometer. Noon. Lowest.	Barometer. Noon. Highest.	Barometer. Noon. Mean.	Barometer. Noon. Variation.	Barometer. Evening. Lowest.	Barometer. Evening. Highest.	Barometer. Evening. Mean.	Barometer. Evening. Variation.	Mean state atmosphere. Temperature.	Mean state atmosphere. Weight.	Mean state atmosphere. Density.	Moisture. Moisture.	Moisture. Rainy days.	Moisture. Quantity rain.	Appearance atmosphere. Number clear days.	Appearance atmosphere. Cloudy ditto.	Thunder No. of times.	Winds. Point.	Winds. Force.
January,	57	70	61	69	78	72	64	74	66	11	29.98	30.17	30.08	.19	29.97	30.14	30.07	.17	30.03	30.17	30.09	.14	66$\frac{2}{3}$	30.08	722				29	2		SW	2
February,	68	74	71	75	86	79	69	76	74	8$\frac{1}{2}$	.89	.14	.02	.25	.89	.17	.01	.28	29.96	.15	.04	.19	75	.02	706		4	2.5	17	11	4	SW	1
March,	68	80	75	80	90	85	73	83	78	10	.85	.12	29.95	.27	.84	.10	29.92	.26	.86	.13	29.97	.27	79	29.95	698		3	0.5	20	11	5	S	3
April,	69	83	79	75	91	85	74	85	82	8	.70	29.97	.83	.27	.68	29.92	.81	.24	.74	29.97	86	.23	82$\frac{1}{2}$	.83	690		6	8.0	17	13	6	S	3
May,	79	87	83	87	94	90	80	89	85	7	.60	.96	.77	.36	.53	.92	.74	.39	.63	30.03	.82	.30	86	.77	682		10	6 0	18	13	14	S	2
June,	79	84	81	80	90	84	79	85	82	3	.44	.70	.59	.26	.40	.68	.56	.28	.47	29.72	.61	.26	83	.58	684		24	24.4	4	26	16	SE	1
July,	79	84	81	80	89	84	80	87	82	3	.44	.73	.59	.29	.45	.67	.56	.22	.47	.73	.62	.26	83	.59	684		24	12.8	4	27	11	SE	1
August,	79	84	81	80	89	84	80	86	82	3	.50	.78	.62	.28	.49	.72	.59	.23	.57	.78	.64	.26	83	.62	685		20	9.3	3	28	16	SE	1
September,	80	84	81	81	89	85	80	85	82	4	.62	.83	.71	.21	.59	.82	.68	.23	.66	.87	.75	.21	83	.71	686		16	11.7	8	22	13	S	1
October,	77	84	81	82	88	85	79	85	83	4	.83	.98	.90	.15	.81	.96	.87	.15	.85	.98	.96	.13	83	.91	691		7	1.4	21	10	4	NW	1
November,	67	80	73	74	85	78	71	82	75	5	.90	30.10	.99	.20	.82	30.08	.98	.26	.80	30.12	30.00	.32	75	.98	705		4	0.5	26	4	0		2
December,	63	70	66	71	76	73	66	73	69	7	.97	.09	30.02	.12	.90	.06	.98	.16	.99	.10	.03	.11	69	30.01	716				31				1
Tot. Mean.	72$\frac{1}{12}$	80$\frac{4}{12}$	76[illegible]	77$\frac{10}{12}$	87$\frac{1}{12}$	82$\frac{5}{12}$	74$\frac{7}{12}$	82$\frac{6}{12}$	78$\frac{6}{12}$	6	29.73	29.96	29.84	.24	29.70	29.94	29.81	.24	29.75	29.96	29.87	.22	77	29.84	696		118	77.5	198	167	89		2

II.

A Synopsis of the different cases that may happen in deducing the Longitude of one place from another by means of ARNOLD's *Chronometers, and of finding the rates when the difference of Longitude is given.---By Mr.* REUBEN BURROW.

IT was formerly the custom to give rules for calculation, without any investigation of their principles; but the contrary method has so much taken place of late, that those who are not acquainted with the theory of a subject are seldom in a capacity of calculating at all; and those who are acquainted with it, must either lose time by recurring thereto continually, or run the hazard of often making mistakes. Indeed the use of practical Rules is so obvious, that NEWTON has often given them when he has omitted their demonstrations; and the want of them has been noted by BACON among the deficiencies of learning; the Hindoos were so particularly attentive in that respect, that they usually gave two rules for the same operation; one couched in the shortest terms possible, and often in verse, for the ease of the memory; and the other more at length as an explanation. It therefore is much to be wished that authors would revert to the ancient custom so far, as to pay some attention to the reduction of their knowledge to practice; that people may not be under the necessity of investigating rules, at the time that they want to use them.

THE following is one rule out of a great number, that I drew up for my own use, in determining the situations of places in India, and I insert it here on account of its utility and easiness of application.

Let E = Error of the Watch from mean time at the first place;

e = Error from mean time at the second place.

T = Time by the Watch at the second place, when the error was e;

D = Difference of Longitude between the places;

N = Interval of mean time between the observations at the two places (found by taking the interval by the Watch, and correcting it according to the estimated rate, &c.)

r = Rate of the Watch, or what it gains or loses in a day of mean time.

Then,

If the Watch be too		then	Is the mean time at the firſt place when the Watch was T at the ſecond, or when the mean time at the ſecond place was		Then if the ſecond place be from the firſt to the	Is the rate of the Watch, and	Is the difference of Longitude.
Faſt for mean time at both places, and the Watch be	Gaining,	then	T—E—nr	T—e	E	(D—E+e) : n	E—e +nr
					W	(e —E—D) : n	e —E—nr
	Loſing,		T—E+nr	T—e	E	(E—D—e) : n	E—e —nr
					W	(D+E—e) : n	e —E+nr
Slow for mean time at both places, and the Watch be	Gaining,	then	T+E—nr	T+e	E	(D+E—e) : n	e —E+nr
					W	(E—D—e) : n	E—e —nr
	Loſing,		T+E+nr	T+e	E	(e —E—D) : n	e —E—nr
					W	(D—E+e) : n	E—e +nr
Slow for mean time at firſt place and faſt at ſecond place, and the watch be	Gaining,	then	T+E—nr	T—e	E	(D+E+e) : n	nr—e —E
					W	(E—D+e) : n	E+e —nr
	Loſing,		T+E+nr	T—e	E	Impoſſible	
					W	(D—E—e) : n	E+e +nr
Faſt for mean time at firſt place and ſlow for mean time at ſecond place, and the Watch be	Gaining,	then	T—E—nr	T+e	E	(D—E—e) : n	E+e +nr
					W	Impoſſible	
	Loſing,		T—E+nr	T+e	E	(E—D+e) : n	E+e —nr
					W	(D+E+e) : n	nr—E —e

III.

MEMORANDUMS *concerning* AN OLD BUILDING, *in the* Hadjipore Diſtrict, *near the* Gunduck River, &c.

By Mr. REUBEN BURROW.

THE pyramids of *Egypt*, as well as thoſe lately diſcovered in *Ireland* (and probably too the *Tower* of BABEL), ſeem to have been intended for nothing more than images of MAHADEO.

Two of the *Sakkara* pyramids, deſcribed by NORDEN, are like many of the ſmall ones uſually built of mud, in the villages of *Bengal:* one of the pyramids of *Daſhour* drawn by POCOCK, is nearly ſimilar to that I am going to mention, except in the acuteneſs of the angle: moſt of the *Pagodas* of the *Carnatic* are either compleat or truncated pyramids; and an old Stone Building without any cavity, which I ſaw in *Yambeah*, near the *Catabeda* river on the *Aracan Coaſt*, differed ſo little from a pyramid, that I did not ſuſpect it was meant for the image of SEEVA, till I was told it by the natives.

THE largeſt building of the kind which I have yet ſeen in *India*, is about two days journey up the *Gunduck* river, near a place called *Keſſercah:* it goes by the name of "BHEEM SAIN'S DEWRY," but ſeems evidently intended for the well known image of MAHADEO; having originally been a cylinder placed upon the fruſtrum of a cone for the purpoſe of being ſeen at a diſtance. It is at preſent very much decayed, and it is not eaſy to tell whether the upper part of the cylinder has been globular or conical; a conſiderable quantity of the outſide is fallen down, but it ſtill may be ſeen a good diſtance up and down the river.

THE day I went from the river to view it was ſo uncommonly hot that the walk and a fever together obliged me to truſt to the meaſurements of a ſervant: for want of a better inſtrument, he took the circumference of the cylindrical part in lengths of a ſpear, and from that as a ſcale, and a ſketch of the building taken at a diſtance, I deduced the following dimenſions: what

Fff dependance

dependance there may be on his meaſures I cannot determine, but probably they are not very erroneous.

Diameter of the Cylindrical part, - - - - - - - - - -	64 feet.
Height of the Cylinder, - - - - - - - - - - - - - -	65
Height of the Conic fruſtum on which the Cylinder is placed,	93
Diameter of the Cone at the baſe, - - - - - - - - - -	363

Both the Cone and the Cylinder were of bricks; thoſe of the laſt were of different ſizes, many of them two ſpans long and one broad; others were of the common ſize, but thinner; and they were well burnt, though bedded in mortar little better than mud; there did not appear any ſigns of the Cylinder being hollow: the Conical part was overgrown with jungle, but I broke through it in ſeveral places and found it every where brick.

I do not recollect whether it be viſible from the ſite of the ancient city where the famous *pillar of Singeah* ſtands, or not; but have a faint idea that it is. What the intention of theſe extraordinary columns may have been originally, is perhaps not ſo eaſy to tell; at firſt ſight it would ſeem that they were for holding inſcriptions, becauſe thoſe of *Bettiah*, *Dehli*, and *Illahabad*, have inſcriptions, (though in a character that has not been yet decyphered); but the pillar of *Singeah* ſeems to have none whatever, for ſome *Bramins* told me they attended at the time it was dug to the foundation, near twenty feet under ground, by a gentleman of *Patna*, who had hopes to have found ſome treaſures; and that there was not the leaſt veſtige of any inſcription upon it. Probably thoſe pillars, Cleopatra's needle, and the *Devil's* bolts at *Boroughbridge*, may all have the ſame religious origin.

Perhaps the connection of time and place may apologize for the diverſity of the ſubject, in mentioning, that while I ſat under the ſhade of a large tree near the pyramid, on account of the ſultry heat, ſome of the people of the adjacent village came and played there with *Cowries*, on a diagram that was formed by placing five points in a circular order, and joining every pair of alternate points by a line, which formed a kind of pentagon; this brought to my recollection a circumſtance told me by a gentleman in *England*, that an old piece of ſilver plate had been dug out of the earth with ſuch a figure upon it; the uſe of it was totally unknown, as well as the age; and I was deſired to find what geometrical properties the figure poſſeſſed; one I remember was, that if any number of points whatever were placed in a circular order, and each

each two alternate points joined, then the ſum of all the ſalient angles of the figure would be equal to two right angles when the number of points was odd; but equal to four right angles when the number was even. EUCLID's properties of the angles of the triangle and trapezium are particular caſes of theſe; but I had no ſuſpicion of the real intention of the figure till I ſaw the uſe here made of it. It ſeems, however, an argument in favour of the identity of the *Druids* and *Bramins*, as well as another well known diagram uſually called the "*Walls of Troy*," which was uſed originally in the *Hindoo* aſtrology: theſe figures however appear to have flowed from a much higher ſource, and to have relation to what LEIBNITZ had a diſtant idea of, in his analyſis of ſituation; EUCLID in his Poriſms, and GIRARD perhaps in his reſtitution of them: in fact, as the modern Algebraiſts have the advantage of transfering a great part of their labour from the head to the hands, ſo there is reaſon to believe that the *Hindoos* had *mechanical methods of reaſoning geometrically*, much more extenſive than the elementary methods made uſe of at preſent, and that even their games were deduced from, and intended perhaps to be examples of them: but this deſerves to be treated more at length elſewhere.

THE ſame apology may perhaps excuſe my mentioning here, that the idea of the *Nile*'s deriving its floods from the melted ſnows, as well as the *Ganges*, appears to be rather imaginary: they ſeem to be cauſed principally by the rains; for the high hills beyond the *Herdwar* apparently retain their ſnow all the year, and therefore the quantity melted could never produce the enormous ſwell of the *Ganges*; not to mention that the effect of a thaw ſeems different from what would ariſe from the mere difference of heat, and therefore might partly take place in winter and the dry ſeaſon. That the rains are ſufficient for the purpoſe without recurring to the hypotheſis of melted ſnows, appears from the following fact: A little before I obſerved the aforeſaid pyramid, I had been a conſiderable diſtance up the *Gunduck*; the river was low for the time of the year, and the hills that ſkirt the borders of *Nepaul* were clear, and apparently not above fifteen coſe diſtant; ſoon after a heavy ſhower fell upon them for ſome hours, and the river ſoon after was filled to the very banks, and continued ſo for many days, and large trees were torn up by the roots, and came driving down with ſuch force by the torrent, that my boat was often endangered. Now on theſe hills there was actually no ſnow whatever; and as the riſe was obviouſly cauſed by the rains, it may reaſonably be concluded that the ſame effect has the ſame cauſe in other places.

IV.

IV.

OBSERVATIONS *of ſome of the* Eclipſes of JUPITER's Satellites.

By Mr. REUBEN BURROW.

The following in the Ganges *and* Burrampooter Rivers.

Apparent time, 1787. d. h. ′ ″					*Satellite.*	*Weather.*	*Im. or Em.*	*Place of Obſervation.*
Sept.	23	11	41	9	2	Moderate,	Imm.	Bankipore Granary,
	24	15	41	22	3	Ditto,	Imm.	Ditto,
Oct.	11	12	45	14	1	Ditto,	Imm.	Colgong; Cleveland's Bungalo,
	23	10	26	20	3	Ditto,	Emer.	Mouth of Jellingy,
	25	11	47	39	2	Ditto,	Imm.	Shore of Ganges, South of Pubna,
	25	16	42	40	1	Ditto,	Imm.	Ditto,
	27	11	13	59	1	Ditto,	Imm.	Coſſundah; Nullah,
	30	14	35	16	3	Ditto,	Emer.	Dacca; Nabob's Houſe,
Nov.	19	8	56	32	2	Ditto,	Imm.	Tealcopee, Burrampooter.
	26	11	33	45	2	Ditto,	Imm.	Bakkamar Chorr,
	26	13	13	57	1	Ditto,	Imm.	Ditto,
	28	7	42	52	1	Ditto,	Imm.	Cazycotta,
Dec.	3	14	10	54	2	Hazy,	Imm.	Goalparah,
	3	15	8	1	1	Moderate,	Imm.	Ditto,
	5	7	51	59	3	Ditto,	Imm.	Ditto,
	5	9	35	26	1	Ditto,	Imm.	Ditto,
	10	16	41	54	2	Very Hazy,	Imm.	Budjrapore,
	10	16	56	17	1	Moderate,	Imm.	Ditto,
	12	11	26	9::	1	Hazy,	Imm.	Tingarchor,
	12	11	48	40:	3	Ditto,	Imm.	Ditto,
	19	15	28	59	1	Ditto,	Emer.	Luckipore,

The following on the Arracan Coaſt.

Apparent time, 1788. d. h. ′ ″					*Satellite.*	*Weather.*	*Im. or Em.*	*Place of Obſervation.*
Feb.	5	10	18	12:	1	Moderate,	Emer.	Cheduba, Flag Staff point,
	12	12	13	54	1	A little hazy,	Emer.	Ditto, Maykawoody Fort,
	21	8	39	29	1	Moderate,	Emer.	Yambeah Ty Fort,
	23	10	57	53	2	Ditto,	Emer.	Ditto, Kyaonemo,
	28	10	35	13	1	Ditto,	Emer.	Cheduba; Cedar point.

The following were obſerved at Colonel WATSON's Docks, *at* Kidderpore, *near the mouth of the* Nullah.

Apparent time, 1788. d. h. ′ ″					*Satellite.*	*Weather.*	*Im. or Em.*	*Place of Obſervation.*
March,	15	8	36	36	1	Moderate,	Emer.	
	19	7	54	2	2	Ditto,	Emer.	
	22	10	34	41	1	Ditto,	Emer.	
	31	7	1	24	1	Ditto,	Emer.	

The following in the Ganges and Rohilcund, &c.

Apparent time, 1788. d. h. ′ ″		*Satellite.*	*Weather.*	*Im. or Em.*	*Place of Observation.*
Oct.	8 14 35 30	3	Moderate,	Emer.	Bankipore,
	29 14 3 4	1	Ditto,	Imm.	Benares, Observatory,
Nov.	1 15 42 36	2	Ditto,	Imm.	Chunar Camp,
	12 17 44 23	1	Hazy,	Imm.	Illahabad Fort,
	14 12 11 29	1	Ditto,	Imm.	Correahcotta,
	20 10 48 28	3	Moderate,	Imm.	In the Ganges, 3 m. below Nudjiff
	20 14 9 52::	3	Ditto,	Emer.	Ghur,
	21 13 58 32	1	Ditto,	Imm.	Jaujemow,
	27 14 44 29	3	Ditto,	Imm.	Cawnpore; Magazine Gaut,
	28 15 49 22	1	Ditto,	Imm.	Ditto,
	30 10 17 2	1	Ditto,	Imm.	Ditto,
Dec.	3 15 2 23	2	Ditto,	Imm.	Joognagpore Gaut,
	7 12 6 5	1	Ditto,	Imm.	East of Canouge, 0° 2′ 29″,
	14 13 54 57	1	Ditto,	Imm.	Futtygur, Magazine,
	21 9 20 53	2	Ditto,	Imm.	Ditto Dr. Cook's Gaut,
	21 15 44 51	1	Ditto,	Imm.	Ditto,
	23 10 12 34	1	Ditto,	Imm.	Ditto,
	28 17 35 22::	1	Hazy,	Imm.	Cutterah,
	30 12 2 48	1	Moderate,	Imm.	Fereedpore,
	1789.				
Jan.	4 14 26 28	2	Ditto,	Imm.	Nabobgunge,
	6 13 53 41	1	Ditto,	Imm.	Pillibeat; Eed Gah,
	8 8 20 16:	1	Ditto,	Imm.	Shairgurr,
	9 14 10 39	3	Ditto,	Imm.	Bowerkah.
	22 14 15 50	1	Ditto,	Emer.	Bhyrah,
	24 8 44 1	1	Ditto,	Emer.	Takoordwar,
	29 14 15 36	2	Ditto,	Emer.	Nidjibabad,
	29 16 7 14	1	Hazy,	Emer.	Ditto,
Feb.	14 13 22 49	3	Moderate,	Emer.	Amrooah,
	14 14 23 40	1	Ditto,	Emer.	Ditto,
	16 8 48 8	2	Ditto,	Emer.	Hussenpore,
	16 8 51 53	1	Hazy,	Emer.	Ditto,
	17 6 53 11:	4	Ditto,	Imm.	Seersah,
	17 11 6 44:	4	Ditto,	Emer.	Ditto,
	23 10 50 1	1	Ditto,	Emer.	Chandowsy,
March,	2 12 48 13	1	Moderate,	Emer.	Futtyghur, Dr. Cook's Gaut,
	2 14 11 10	2	Ditto,	Emer.	Ditto,
	11 9 22 21	1	Ditto,	Emer.	Mobarickpore Gaut,
	18 11 23 56	1	Ditto,	Emer.	Chunar Fort,
	20 9 4 40	2	Ditto,	Emer.	Benares, Observatory,
	27 7 59 16	1	Ditto,	Emer.	Bankypore, Granary,
	27 11 53 1	2	Ditto,	Emer.	Ditto,
	29 10 31 10	3	Ditto,	Imm.	Ditto,
April	3 9 56 45:	1	Ditto,	Emer.	Patna; Chehelsuttoon,
	10 11 59 48:	1	Very Hazy,	Emer.	Mongeer, Rocky Point,
	19 8 30 56	1	Hazy,	Emer.	Rajmahal,
	26 10 31 22	1	Moderate,	Emer.	Teacally Dumdumma,

The following were observed at Ruſſahpugly, *near* Calcutta.

Apparent time, 1789. d. h. ′ ″	*Satellite.*	*Weather.*	*Im. or Em.*	*Place of Obſervation.*
May 12 8 48 50	1	Moderate,	Emer.	
Dec. 19 11 59 15	1	Hazy,	Imm.	
19 14 5 33	3	Ditto,	Imm.	
22 11 23 4	2	Moderate,	Imm.	
26 13 49 38	1	Ditto,	Imm.	
1790.				
Jan. 2 15 39 32	1	Ditto,	Imm.	
18 13 49 51	1	Miſt & wind	Imm.	
23 10 44 48	2	Ditto,	Imm.	
24 9 40 57	3	Hazy,	Imm.	
27 10 8 19	1	Moderate,	Imm.	
31 13 36 35	3	Very Hazy,	Imm.	
Feb. 1 17 32 48	1	Hazy,	Imm.	
3 12 1 30	1	Moderate,	Imm.	
17 10 38 18	2	Ditto,	Emer.	
19 12 33 56	1	Ditto,	Emer.	
26 14 28 38	1	Hazy,	Emer.	
28 8 57 22	1	Moderate,	Emer.	
March 1 9 0 52	3	Ditto,	Emer.	
5 16 24 13	1	Hazy,	Emer.	
16 7 18 14	1	Moderate,	Emer.	
23 9 14 25	1	Ditto,	Emer.	
26 7 36 11	4	Ditto,	Imm.	

The two following were at Jowgatta, *near* Kriſhnagur.

Apparent time, 1790. d. h. ′ ″	*Satellite.*	*Weather.*	*Im. or Em.*	*Place of Obſervation.*
April, 22 10 27 50	2	Moderate,	Emer.	
22 11 31 10	1	Ditto,	Emer.	

Thoſe to the 31ſt of March, 1788 were obſerved with a glaſs made by WATKINS that magnified about 110 times; thoſe from thence to the 12th of May, 1790, were obſerved with one of RAMSDEN's teleſcopes of the ſort lately made for the Navy, and the remainder with a glaſs made by DOLLAND that magnifies about eighty times.

I ſhall conclude theſe obſervations with a remark that highly concerns both the buyers and makers of teleſcopes; namely, that the parts which compoſe the object glaſs of an Achromatic, are generally put together in ſuch a manner that they cannot be taken aſunder; and the braſs part that they are bedded in, ſhoots a number of chymical ramifications between the glaſſes, that in the courſe of a year renders a teleſcope of little or no ſervice. This defect the maker may eaſily remove by making the compound object glaſs capable of being taken to pieces, or the parts in ſome other ſubſtance not liable to this defect.

III.

III.

A Proof that the Hindoos *had the* Binomial Theorem.

By Mr. REUBEN BURROW.

THE *Iſlands* in the bay of *Bengal* are many of them covered with ſhells and marine productions to a great height, and there are beds of large ſmooth pebbles near the *Herdwar* ſome hundreds of feet above the preſent level of the *Ganges*; the ſea has therefore gradually been retiring, and conſequently the poſition of the Equator was formerly farther north than it is at preſent in this part of the earth: and if a few ſimilar obſervations were made in other countries, it is evident that the ancient ſituation of the pole upon the ſurface of the earth might be determined ſufficiently near for explaining many difficulties and paradoxes in Geographical antiquities; for this purpoſe alſo, it would be adviſeable to have permanent meridian lines drawn in high northern latitudes, to be compared in ſucceeding ages, and alſo to have marks cut upon rocks in the ſea, to ſhew the proper level of the water.

In the aforeſaid poſition of the Equator, the ſands of *Tartary* were inhabitable and the Siberian climates temperate; the deſerts of the leſſer *Buckharia* were then part of the ſeat of the *Paradiſe of Moſes*; and the four ſacred rivers of *Eden* went through *India*, *China*, *Siberia*, and into the *Caſpian Sea*, reſpectively; this appears from a *Bramin* map of the world in the *Sanſcrit language*, which I met with about two years ago in the higher parts of *India*, together with a valuable Treatiſe of Geography upon the ſyſtem of *Boodh*; both of which I communicated, with my idea on the ſubject, to Mr. Wilford, of the *Bengal* Engineers; and from him the world may expect ſhortly to be favoured with the firſt true repreſentation of Scriptural and *Hindoo* Geography.

From the aforeſaid country the *Hindoo* religion probably ſpread over the whole earth: there are ſigns of it in every northern country, and in almoſt every ſyſtem of worſhip: in *England* it is obvious; Stonehenge is evidently one of the Temples of *Boodh*; and the Arithmetic, the Aſtronomy, Aſtrology, the Holidays, Games, names of the Stars and figures of the Conſtellations; the ancient Monuments, Laws, and even the languages of the different nations, have the ſtrongeſt marks of the ſame original. The worſhip of the ſun and fire; human and

 animal

animal ſacrifices, &c. have apparently once been univerſal: the religious ceremonies of the papiſts ſeem in many parts to be a mere ſervile copy of thoſe of the *Goſeigns* and *Fakeers*; the Chriſtian Aſcetics were very little different from their filthy original the *Byraggys*, &c.; even the hell of the northern nations is not at all like the hell of the ſcripture, except in ſome few particulars; but it is ſo ſtriking a likeneſs of the hell of the *Hindoos*, that I ſhould not at all be ſurpriſed if the ſtory of the ſoldier that ſaw it in SAINT PATRICK's purgatory, deſcribed in MATTHEW PARIS's hiſtory, ſhould hereafter turn out to be merely a tranſlation from the *Sanſcrit* with the names changed. The different tenets of *Popery* and *Deiſm* have a great ſimilarity to the two doctrines of *Brahma* and *Boodh*; and as the *Bramins* were the authors of the Ptolemaic ſyſtem, ſo the *Boodhiſts* appear to have been the inventors of the ancient *Philolaic* or *Copernican*, as well as of the doctrine of attraction; and probably too, the eſtabliſhed religion of the *Greeks* and the *Eleuſinian* myſteries may only be varieties of the two different ſects. That the *Druids* of *Britain* were *Bramins* is beyond the leaſt ſhadow of a doubt; but that they were all murdered and their ſciences loſt, is out of the bounds of probability; it is much more likely that they turned Schoolmaſters and Freemaſons and Fortune-tellers, and in this way part of their ſciences might eaſily deſcend to poſterity, as we find they have done: an old paper, ſaid to have been found by *Locke*, bears a conſiderable degree of internal evidence both of its own antiquity and of this idea; and on this hypotheſis it will be eaſy to account for many difficult matters that perhaps cannot ſo clearly be done on any other, and particularly of the great ſimilarity between the *Hindoo* ſciences and ours: a compariſon between our eldeſt ſcientific writers and thoſe of the *Hindoos*, will ſet the matter beyond diſpute; and fortunately the works of *Bede* carry us twelve hundred years back, which is near enough to the times of the *Druids* to give hopes of finding their remains: I ſhould have made the compariſon myſelf, but *Bede* is not an author to be met with in this country; however, I compared an Aſtrolabe in the *Nagry* character (brought by Dr. MACKINNON from *Jynagur*) with CHAUCER's deſcription, and found them to agree moſt minutely; even the center pin, which CHAUCER calls "the horſe," has a horſe's head upon it in the inſtrument; therefore if CHAUCER's deſcription ſhould happen to be a tranſlation from *Bede*, it will be a ſtrong argument in favour of the hypotheſis; for we then could have nothing from the *Arabians*. What *Bungey* and *Swiſſet* may contain, will alſo deſerve enquiry; and that the compariſon

comparifon may be the readier made, where the books are procurable, I mean very fhortly to publifh tranflations of the *Leelavotty* and *Beej Ganeta*, or the Arithmetic and Algebra of the *Hindoos*.

It is much to be feared, however, that many of the beft treatifes of the *Hindoos* are loft, and that many of thofe that remain are imperfect; by the help of a *Pundit*, I tranflated part of the *Beej Ganeta* near fix years ago, when no *European* but myfelf, I believe, even fufpected that the *Hindoos* had any Algebra; but finding that my copy was imperfect, I deferred compleating the tranflation in hopes of procuring the remainder; I have fince found a fmall part more, and have feen many copies; but from the plan of the work (which in my opinion is the beft way of judging) they ftill feem all to be imperfect, though the copier generally takes care to put at the end of them that they are compleat. I have the fame opinion of the *Leelavotty*, and for the fame reafon; indeed, it is obvious that there muft have been treatifes exifting where Algebra was carried much farther; becaufe many of their rules in Aftronomy are approximations deduced from infinite feries; or, at leaft, have every appearance of it; fuch for inftance as finding the fine from the arc, and the contrary; and finding the angles of a right angled triangle from the hypothenufe and fides, independant of tables of fines; and feveral others of a fimilar nature much more complicated. I have been informed by one of their *Pundits*, that fome time ago, there were other treatifes of Algebra befides that juft mentioned, and much more difficult, though he had not feen them; and therefore as it is possible they may ftill be exifting, and yet be in danger of perifhing very foon, it is much to be wifhed that people would collect as many of the books of fcience as poſsible, (their poetry is in no danger), and particularly thofe of the doctrine of Boodh, which perhaps may be met with towards *Thibet*. That many of their beft books are depraved and loft is evident, becaufe there is not now a fingle book of geometrical elements to be met with; and yet that they had elements not long ago, and apparently more extenfive than thofe of Euclid, is obvious from fome of their works of no great antiquity: the fame remarks are applicable to their Cofmographical remains, in fome of which there are indications of an Aftronomy fuperior to that of the Soorya Siddhant, and fuch popular treatifes.

Till we can therefore find fome of their more fuperior works, it muft be rather from the form and conftruction of their aftronomical tables and rules, and the properties implied in their accidental folutions of queftions, &c. that we can judge what they formerly knew, than otherwife; that they were acquainted

quainted with a differential method similar to NEWTON's, I shall give many reasons for believing, in a treatise on the principles of the *Hindoo* Astronomy, which I began more than three years ago, but was prevented from finishing, by a troublesome and laborious employment that for two years gave me no leisure whatever; and which (though the small time I had to spare since has been employed in writing a comment on the works of NEWTON, and explaining them to a very ingenious native who is translating them into *Arabick*) I hope ere long to have an opportunity of compleating: at present I shall only give an extract of a paper explaining the construction of some tables, which first led me to the idea of their having a differential method; it is part of one out of a number of papers that were written in the latter part of the year 1783, and the begining of 1784, and of which several copies were taken by different people, and some of them sent to *England:* this particular extract, was to investigate the rules at pages 253, 254, and 255, of Mons. GENTIL's Voyage, of which the Author says, "*Je n'ai pu savoir sur quels principes cette table est fondée, &c.*" and is as follows:

"Now, by proceeding in the manner explained in the aforesaid paper to cal-
"culate the right ascension and ascensional difference for *Tirvalour*, and after-
"wards taking the differences Algebraically, and reducing them to puls of a
"*Gurry*, as in the following table, the principles of the method will be evi-
"dent.

S.	*Obl. Ascens.* R. A.	*Obl. Ascens.* Asc. diff.	*First diff. of Obl. Ascension.*	*Ditto reduced to Puls of a Gurry.*	*Do. farther reduced.*
	° ′	° ′	° ′ ° ′		
0	0 0	—0 0			
1	27 54	—2 19	27 54—2 19	279—23	256
2	57 49	—4 13	29 55—1 54	299—19	280
3	90 0	—4 59	32 11—0 46	322— 8	314
4	122 11	—4 13	32 11+0 46	322+ 8	330
5	152 6	—2 19	29 55+1 54	299+19	318
6	180 0	+0 0	27 54+2 19	279+23	302
7	200 54	+2 19	27 54+2 19	279+23	302
8	237 49	+4 13	29 57+1 54	299+19	318
9	270 0	+4 59	32 11+0 46	322+ 8	330
10	302 11	+4 13	32 11—0 46	322— 8	314
11	332 6	+2 19	29 55—1 54	299—19	280
12	360 0	+0 0	27 54—2 19	279—23	256

"The

“ The fifth and ſixth columns ſufficiently explain the tables in page 253 and “ 254 of M. *Gentil*; but there remains a part more difficult, namely, why in “ calculating the *Bauja*,” or the doubles of the firſt differences of the aſcenſional “ difference “ $\frac{20}{60}$ of the length of the ſhadow is taken for the firſt; $\frac{4}{5}$ of the “ firſt term for the ſecond, and $\frac{1}{3}$ of the firſt term for the third?” “ The pri- “ mary reaſon of taking differences here, ſeems to be, that the chords may be “ nearly equal to the arcs, and that, by adding of the differences, the arcs “ themſelves may be found nearly; the reaſon will appear from the following “ inveſtigation. Let N be the equatorial ſhadow of the *Bramins* in *Bingles*, “ then 720 the length of the *Gnomon*, or twelve *Ongles*, will be to N the ſha- “ dow, as radius to the tangent of the latitude; and radius to the tangent of the “ latitude as the tangent of the declination to the ſine of the aſcenſional dif- “ ference; conſequently, 720 is to N as the tangent of declination to the ſine “ of the aſcenſional difference. Now, if the declinations for one, two, and “ three ſines be ſubſtituted in the laſt proportion, we get the ſines of the three “ aſcenſional differences in terms of N and known quantities; and, if theſe “ values be ſubſtituted in the Newtonian form for finding the arc from the ſine, “ we get the arcs in parts of the radius; and if each of theſe be multiplied by “ 3600 and divided by 6,28318, the values comes out in puls of a *Gurry* if N “ be in *Bingles*, but in parts of a *Gurry* if N be in *Ongles*; and by taking the “ doubles, we get the values nearly as follow:

Values.	*Difference*	
0,00000 N		
0,33056 N	0,33056 N = 1-3 N nearly,	the values
0,59928 N	0,26872 N = 4-5 of 1-3 N nearly,	uſed by the
0,70860 N	0,10932 N = 1-3 N nearly,	*Bramins.*

“ Now, becauſe the values in the firſt column are doubles of the aſcenſional “ differences for one, two, and three ſines, their halves are the aſcenſional dif- “ ferences in parts of a *Gurry*, ſuppoſing N to be in *Ongles*; and if each of “ theſe halves be multiplied by ſixty, the products, namely, 9,9168 N, “ 17,9784 N, and 21,2580 N will be the ſame in puls of a *Gurry*; and if to “ get each of theſe nearly in round numbers, the whole be multiplied by “ three, and afterwards divided by three, the three products will be 29,75 N, “ 53,94 N, and 63,77 N, which are nearly equal to thirty N; fifty-four N, “ and ſixty-four N reſpectively; and hence the foundation of the *Bramin* rule “ is evident, which directs to multiply the equatorial ſhadow by thirty, fifty- “ four,

" four, and ſixty-four reſpectively; and to divide the products by three for the
" *Chorardo* in puls: and theſe parts anſwer to one, two, and three ſigns of lon-
" gitude from the true equinox; and therefore the *Ayanongſh*, or *Bramin* pre-
" ceſſion of the equinox, muſt be added to find the intermediate *Chorardo* by
" proportion."

Though the agreement of this inveſtigation with the *Bramin* reſults, is no proof that the *Hindus* had either the differential method, or Algebra, it gave me at the time a ſtrong ſuſpicion of both; and yet, for want of knowing the name that Algebra went by in *Sanſcrit*, I was near two years before I found a treatiſe on it, and even then I ſhould not have known what to enquire for, if it had not come into my mind to aſk how they inveſtigated their rules. Of the differential method, I have yet met with no regular treatiſe, but have no doubt whatever that there were ſuch, for the reaſons I have before hinted; and I hope others will be more fortunate in their enquiries after it than myſelf.

With reſpect to the *Binomial Theorem*, the application of it to fractional indices will perhaps remain for ever the excluſive property of *Newton*; but the following queſtion and its ſolution evidently ſhew that the *Hindus* underſtood it in whole numbers to the full as well as *Briggs*, and much better than *Paſcal*. Dr. *Hutton*, in a valuable edition of *Sherwin*'s tables, has lately done juſtice to *Briggs*; but Mr. *Whitchell*, who ſome years before pointed out *Briggs* as the undoubted inventor of the differential method, ſaid he had found ſome indications of the *Binomial Theorem* in much older authors. The method, however, by which that great man inveſtigated the powers independant of each other, is exactly the ſame as that in the following tranſlation from the *Sanſcrit*.

" A RAJA's palace had eight doors; now theſe doors may either be opened
" by one at a time; or by two at a time; or by three at a time; and ſo on
" through the whole, till at laſt all are opened together: it is required to tell
" the numbers of times that this can be done?

" Set down the number of the doors, and proceed in order gradually decreaſ-
" ing by one to unity, and then in a contrary order, as follows:

8	7	6	5	4	3	2	1
1	2	3	4	5	6	7	8

" DIVIDE the firſt number eight by the unit beneath it, and the quotient
" eight ſhews the number of times that the doors can be opened by one at a
" time:

"time: multiply this last eight by the next term seven, and divide the product "by the two beneath it, and the result twenty-eight is the number of times "that two different doors may be opened: multiply the last found twenty-"eight by the next figure six, and divide the product by the three beneath it, "and the quotient fifty-six, shews the number of times that three different "doors may be opened: again, this fifty-six multiplied by the next five, and di-"vided by the four beneath it, is seventy, the number of times that four differ-"ent doors may be opened: in the same manner fifty-six is the number of fives "that can be opened; twenty-eight the number of times that six can be "opened: eight the number of times that seven can be opened; and lastly, "one is the number of times the whole may be opened together, and the sum "of all the different times is 255."

THE demonstration is evident to mathematicians; for as the second term's coefficient in a general equation shews the sum of the roots, therefore in the n power of $1+1$, where every root is unity, the coefficient shews the different *Ones* that can be taken in n things: also because the third term's coefficient is the sum of the products of all the different twos of the roots, therefore when each root is unity, the product of each two roots will be unity, and therefore the number of units, or the coefficient itself, shews the number of different *twos* that can be taken in n things. Again, because the fourth term is the sum of the products of the different threes that can be taken among the roots, therefore when each root is unity, the product of each three will be unity, and therefore every unit in the fourth will shew a product of three different roots, and consequently the coefficient itself shews all the different *threes* that can be taken in n things; and so for the rest. I should not have added this, but that I do not know well where to refer to it.

P. S. THERE is an observation perhaps worth remarking, with respect to the change of the POLES; namely, that the small rock Oysters are generally all dead within about a foot above high water mark; now, possibly, naturalists may be able to tell the age of such shells nearly by their appearance; and if so, a pretty good estimate may be formed of the rate of alteration of the level of the sea in such places where they are; for I made some astronomical observations on a rock in the sea, near an island about seven miles to the south of the island of *Cheduba*, on the *Aracan Coast*, whose top was eighteen feet above high water

mark, and the whole rock covered with thoſe ſhells faſt grown to it, but all of them dead, except thoſe which were a foot above the high water mark of that day, which was February 2, 1788: the ſhells were evidently altered a little in proportion to their height above the water, but by no means ſo much as to induce one to believe that the rock had been many years out of it: all the adjacent iſlands and the coaſt ſhewed ſimilar appearances, and therefore it was evidently no partial elevation by ſubterranean fires, or any thing of that ſort: this is alſo apparent from the iſland of *Cheduba* itſelf, in which there is a regular ſucceſſion of ſea beaches and ſhells more and more decayed to a great height. By a kind of vague eſtimation from the trees and the coaſts and ſhells, &c. (on which, however, there is not the leaſt dependance) I ſuppoſed that the ſea might be ſubſiding at the rate of about three inches in a year.

ASIATIC

ASIATICK RESEARCHES:

OR,

TRANSACTIONS

OF THE

SOCIETY INSTITUTED IN BENGAL,

FOR INQUIRING INTO THE

HISTORY AND ANTIQUITIES, THE ARTS, SCIENCES, AND LITERATURE,

OF

ASIA.

VOLUME THE THIRD.



Garrow Man in his War Dress.





A Garrow Man in his War Dress.

Mutlow. f. Pal

I.

THE EIGHTH ANNIVERSARY DISCOURSE.—*See the Works of Sir William Jones, Vol. I. p.* 113.

See the Works of Sir William Jones, Vol. I. p. 113.

II.

OBSERVATIONS ON THE INHABITANTS OF THE GARROW HILLS,

MADE DURING A PUBLIC DEPUTATION IN THE YEARS 1788 AND 1789.

By JOHN ELIOT, *Esq.*

IN the month of *September* 1788, I was deputed by Government to inveſtigate the duties collected on the *Garrow* hills, which bound the north-eaſtern parts of *Bengal*; and, to conciliate the good-will of the people, who had hitherto known no intercourſe with *Europeans*, ſome ſcarlet cloth was given me by Government to be diſtributed to them.

The mountaineers, who inhabit different parts of *India*, have been generally conſidered ſavages, equally unreſtrained by law and morality, and watchful to take every opportunity of committing depredations on the low country, pillaging the inhabitants, and deſtroying their villages, whenever they could do ſo with impunity. At *Boglepore*, however, it has been proved, that the hill-people, by good treatment and encouragement, may be in a great degree civilized, and rendered at leaſt peaceable and inoffenſive, if not ſerviceable: my obſervation of the character and the conduct of the *Garrows* has induced me to believe the ſame good conſequences may be expected from encouraging them; but I propoſe to relate in plain language what I experienced on my viſit to them, and leave others to form their own judgment; and, as I am the firſt *European* who has travelled among them, I ſhall alſo add a few obſervations on the country, and on what attracted my notice as being in any reſpect peculiar.

On drawing near the hills you have a beautiful ſight of three ranges of mountains, riſing one above another; but on nearer approach they vaniſh, except the

Gonaſſers,

Gonaſſers, the lower range, in appearance, inſignificantly ſmall. The verdure and rich land, however, fully recompenſe the loſs; and, turn your eye which way you will, you ſee ſomething to cheer the mind, and raiſe the fancy, in the numerous ſmall villages round about, protected from the heat by a variety of trees interſperſed.

The firſt paſs I went to, was *Ghoſegong*, ſituated on the weſt ſide of the *Natie* river. Here a great number of *Garrows* reſide at the foot of the paſs in three villages, *Ghoſegong*, *Ghonie*, and *Borack*. The head people of the villages are called *Boneahs*, a name uſed by the head *Rájás* in *Bengal*, when the king reſided at *Gour*. Whence they derived this name, I could not learn; and many other things, which might lead to diſcoveries, eſcaped my knowledge from the want of a good interpreter.

Oodassey *Booneah* is looked on as the head man of this paſs at preſent, having moſt influence with his ſect; but the rightful chief is Momee, a woman, and her power being, by eſtabliſhed uſage, transferrable by marriage to her huſband, he ought in conſequence to preſide; but, from his being a young and ſilly man, the chiefship is uſurped by Oodassey, and his uſurpation is ſubmitted to by Momee and her huſband. Oodassey however is by no means a violent or artful man. He is far from poſſeſſing a bad diſpoſition, is a mild man, and by all accounts takes great pains to do juſtice, and keep up unanimity with his people.

The village *Ghoſegong* is ſurrounded by a little jungle. On paſſing it, the village is opened to your ſight, conſiſting of *Chaungs* or Houſes from about thirty to 150 feet long, and twenty or forty broad.

Theſe *Garrows* are called by the villagers and upper hill people *Counch Garrows*, though they themſelves, if you aſk them of what caſt they are, will anſwer *Garrows*, and not give themſelves any appellation of caſt, though there are many caſts of *Garrows*, but with what differences I had not time to aſcertain.

The ſoil is of a fine black earth, here and there intermixed with ſpots of red earth: its richneſs is plainly ſeen from the quickneſs of vegetation. The rice is in many places equal to the *Benares* long rice. The muſtard ſeed is twice as big as any produced in the pergunnahs of *Bengal*, where I have been, and the oil it produces, is as ſuperior to, as the ſize of its grain is greater than, any other. The hemp is equally good, but, as to its ſuperiority to what may be produced in other pergunnahs, I am unable to ſpeak with certainty: as far as I can judge from my own obſervation, the ſort brought to the *Calcutta* market is not equal to what is produced on the borders of the hills. The paſture for cattle may be claſſed next in quality

quality to that of *Plaſſy* plain; and this I infer from its being generally known, the *Sheerpour* and *Suſung* ghee is nearly as good as that made at *Plaſſy*.

There are rivers at the ſeveral paſſes. Thoſe of note are the *Natie*, *Mahareeſee*, *Summaſſerry*, and *Mahadeo*. On the weſt ſide of the *Natie* is *Ghoſegong*, and on the eaſt the *Suſſoor* paſs. *Abrahamabad* or *Bygombarry* is on the eaſt ſide of the *Mahareeſee*; *Aughur*, on the eaſt of *Summaſſerry*; and *Burradowarrah*, on the weſt of *Mahadeo*. Theſe rivers are all of a ſandy and gravelly bottom, with much limeſtone and iron. The *Mahadeo* has abundance of coals, the oil of which is eſteemed in the hills as a medicine for the cure of cutaneous diſorders, and is reputed to have been firſt diſcovered to the hill people and villagers by a *Fakeer*. The mode of extracting the oil is ſimple. A quantity of coals are put into an earthen pot, the mouth of which is ſtopped with long graſs by way of ſtrainer. This pot is put into a large deep pan, perforated at the bottom, ſo as to admit of the neck of the pot being put through it; the pan is ſupported upon bricks to prevent the neck of the pot from touching the ground, and alſo that a veſſel may be placed under the ſtrainer as a reſervoir for receiving the oil as it drops. The pan is filled with dry cow dung, which is uſed as fuel, and extracts the oil in the courſe of an hour.

There are but few ſorts of fiſh in theſe rivers: turtle are to be had in great numbers, and are always conſecrated by ſacrifice before they are eaten. The hill people are however fully recompenſed for the loſs of fiſh in the rivers, by the great abundance they get from the neighbouring lakes.

A *Garrow* is a ſtout well-ſhaped man, hardy and able to do much work; of a ſurly look, flat *Cáfri* like noſe, ſmall eyes, generally blue, or brown, forehead wrinkled, and overhanging eye-brow, with large mouth, thick lips, and face round and ſhort; their colour is of a light or deep brown; their dreſs conſiſts of a brown girdle, about three inches broad; having in the centre a blue ſtripe; it goes round the waiſt, is paſſed between the thighs, and is faſtened behind, leaving one end or flap hanging down before, about eight inches; ſometimes it is ornamented with braſs-plates; with rows of ivory or a white ſtone ſhaped like bits of tobacco-pipes, about half an inch long; the braſs plate is made to reſemble a button, or an apothecary's weight, but more indented: ſome have it ornamented with little bits of braſs, ſhaped like a bell: ſome wear an ornament on their head about three or five inches broad, decorated in the ſame manner as the flap, ſerving to keep their hair off the face, which gives them a wild fierce appearance. Some tie their hair on the crown, in a looſe careleſs manner, while others crop it cloſe. The *Booneahs* or chiefs

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chiefs wear a filk turban; to the girdle they affix a bag containing their money and *pawns*, and alfo a net for holding the utenfils with which they light their pipe hung near to it by a chain.

The women are the ugliest creatures I ever beheld, fhort and fquat in their ftature, with mafculine faces, in the features of which they differ little from the men. Their drefs confifts of a dirty red cloth, ftriped with blue or white, about fixteen inches broad, which encircles the waift, and covers about three-fourths of the thigh. It never reaches to the knee, and being but juft long enough to tie above on the left fide, part of the left thigh, when they walk, is expofed. On their necks they have a ftring of the ornaments above defcribed refembling tobacco-pipes, twifted thirty or forty times round, but negligently, without any attention to regularity; their breafts are expofed to view, their only clothing being the girdle abovementioned; to their ears are affixed numbers of brafs rings, increafing in diameter from three to fix inches: I have feen thirty of thofe rings in each ear; a flit is made in the lobes of the ear, which increafe from the weight of the rings and in time will admit the large number ftated. This weight is however partly fupported by a ftring, which paffes over their heads; a tape three inches broad ties their hair, fo as to keep it back from their foreheads, though generally it is tied with a ftring on the crown of the head. The wives of the *Booneahs* cover their heads with a piece of coarfe cloth, thirteen or fourteen inches broad, and two feet long, the end of which with their hair, hangs down behind, flowing loofe on their backs. The women work as well as the men, and I have feen them carry as great burthens. Their hands, even thofe of the wives of the *Booneahs*, bear evident marks of their laborious occupations.

Thefe people eat all manner of food, even dogs, frogs, fnakes, and the blood of all animals. The laft is baked over a flow fire in hollow green bamboos, till it becomes of a nafty dirty green colour. They are fond of drinking to an excefs. Liquor is put into the mouth of infants, almoft as foon as they are able to fwallow: they have various forts of fpirits, but that moftly drunk is extracted from rice, foaked in water for three or four days before ufe. Their cookery is fhort, as they only juft heat their provifions; excepting rice and guts, the firft of which is well boiled, and the other ftewed till they are black. Indeed, excepting thefe, their animal food is eaten almoft raw.

In times of fcarcity many of the hill people fubfift on the *Kebul*, which in growth is faid to be like the *Palmira*; and the interior part of the *trunk*, when pounded and

and fteeped in water, is an article of food, in fo much as to be the common means of fuftenance during a fcarcity of grain. When boiled it is of a gelatinous fubftance, and taftes, when frefh, like a fugar cane: thofe, who can afford it, mix rice with it. They alfo fubfift on the *Kutchu*, a fort of *Yam*, found in great plenty about the hills. I faw three forts, though I could not learn they had any feparate name. One has a number of buds on it, is faid to be a cooling medicine, and is eaten boiled or baked. Some of them I brought with me from the hills, and being bruifed in the bafket ufed in bringing them from the hills, I cut off the rotten part, which I found to be of no detriment to their growth, although out of the ground. At *Dacca* I gave them to Mr. RICHARD JOHNSON, who, I underftand, delivered them to Colonel KYD, the fuperintendant of the Company's botanical garden, where, I hear, they have produced a very handfome flower. This plant was cultivated by the *Garrows*, nearly in the fame manner as we do potatoes in *England*; a bud being broken off to be fown for a plant. The *Garrows* fay it yields, after it is dug out of the ground, and laid by for the enfuing feafon of cultivation (commencing immediately on the breaking up of the rains) from three to ten buds. Another fort of *Kutchu* grows at the tops of the hills, and is found by its fprout, which twifts itfelf round the trunk and branches of trees. I have feen the fprout from ten to twenty feet high, the leaves have three fegments like a vine leaf, but more pointed: of deep green, and very fmall. The root is found from a foot to two feet and a half below the ground, is in fhape tapering, of a reddifh colour, and in length from five inches to a foot and half: it is eaten roafted. The other fpecies grows in the fame manner, but is of a dirty yellow colour.

The houfes of thefe *Garrows*, called *Chaungs*, are raifed on piles, about three or four feet from the ground, from thirty to 150 feet in length; and in breadth from ten to forty, and are roofed with thatch. The props of the *Chaung* confift of large *faul* timbers: in the centre there are eight, and on the fides from eight to thirty: over thefe are placed horizontally large timbers, for a fupport to the roof, and tied faft, fometimes with ftrings; but ftring is rarely ufed for this purpofe; the tying work being moftly done with flips of grafs or cane. The roof is neatly executed, and with as much regularity as any of our Bungalow thatches. When I fay this, however, I fpeak of the *Chaungs* of the *Booneahs:* I went into few of the *Chaungs* of the lower clafs. The roof confifts of mats and ftrong grafs. The fides of the houfe are made from the fmall hollow bamboos cut open, flatted, and woven as the common mats are. The floor is made in the fame manner; but of a ftronger bamboo.

bamboo. The *Chaung* confifts of two apartments, one floored and raifed on piles as defcribed, and the other without a floor, at one end, for their cattle: at the other end is an open platform, where the women fit and work. On one fide alfo is a fmall raifed platform, ufually about fix feet fquare, inclofed at the fides and open above: here the children play: in the centre of the *Chaung* they cook their victuals, a fpace of about five feet fquare being covered with earth; on one fide a little trap door is made in the floor, for the convenience of the women on certain occafions, which creates much filth under their *Chaungs*. Indeed a great part of their dirt is thrown under the *Chaung*, and the only fcavengers I faw, were their hogs; but luckily for them, they have plenty of thofe animals.

Bugs cover their wearing apparel, of the fame fort, as thofe which infeft beds in England: during my journey along the hills I fuffered very much from them.

The difpofition of a *Garrow* could not be accurately known in the fhort time I had to obferve it; yet my intercourfe with them, which was of the moft open nature, will, I think, allow me to fay fomething of it.

Their furly looks feem to indicate ill temper, but this is far from being the cafe, as they are of a mild difpofition. They are, moreover, honeft in their dealings, and fure to perform what they promife. When in liquor they are merry to the higheft pitch: then men, women, and children will dance, till they can fcarce ftand. Their manner of dancing is as follows: twenty or thirty men of a row ftanding behind one another, hold each other by the fides of their belts, and then go round in a circle hopping on one foot, then on the other, finging and keeping time with their mufic, which is animating, though harfh and inharmonious, confifting chiefly of tomtoms, and brafs pans, the firft generally beaten by the old people, and the laft by the children. The women dance in rows and hop in the fame manner, but hold their hands out, lowering one hand and raifing the other at the fame time, as the mufic beats, and occafionally turning round with great rapidity. The men alfo exhibit military exercifes with the fword and fhield, which they ufe with grace and great activity. Their dancing at their feftivals lafts two or three days, during which time they drink and feaft to an excefs, infomuch that it requires a day or two afterwards to make them perfectly fober again, yet during this fit of feftivity and drunkennefs they never quarrel.

Marriage is in general fettled amongft the parties themfelves, though fometimes by their parents: if it has been fettled by the parties themfelves, and the parents of either refufe their affent, the friends of the oppofite party, and even others unconnected,

nected, go and by force compel the diffenters to comply; it being a rule among the *Garrows* to affift thofe that want their help, on thefe occafions, let the difparity of age or rank be ever fo great. If the parents do not accede to the wifh of their child, they are well beaten till they acquiefce in the marriage, which being done, a day is fixed for the fettlement of the contract, or rather for a complimentary vifit from the bride to the bridegroom, to fettle the day of marriage, and the articles, of which the feaft fhall confift, as well as the company to be invited; and they then make merry for the night. The invitations on thefe occafions are made by the head man of a *Chaung* fending a *paun* to the inhabitants of another *Chaung*, as they cannot invite one out of a *Chaung* without the reft: the man who carries the *paun*, ftates the purpofe for which it is fent, and the next day an anfwer is made, if the invitation be accepted, but not otherwife, as they never wifh to give a verbal refufal; and, therefore, if no body returns the next day, the invitation is underftood to be refufed.

On the nuptial day, the parties invited go to the bride's houfe; it being the cuftom among the *Garrows* for the bride to fetch the bridegroom: when the wine, &c. are ready, and all the company arrived, they begin finging and dancing, and now and then take a merry cup; while a party of the women carry the bride to the river, wafh her, and on their return home, drefs her out in her beft ornaments; this completed, it is notified to the company, and the mufic ceafes: then a party take up the wine, provifions, drums, pans, and a cock and hen, and carry them to the bridegroom's houfe in proceffion; the cock and hen being carried by the prieft, after which, the bride follows, with a party of women, walking in the centre, till fhe arrives at the bridegroom's houfe, where fhe and her party feat themfelves in one corner of the *Chaung* near the door; the remaining vifitors then proceed to the bridegroom's houfe, and the men fit at the further end of the room, oppofite to the women; the men then again begin finging and dancing; the bridegroom is called for; but, as he retires to another *Chaung*, fome fearch is made for him, as if he were miffing, and, as foon as they find him, they give a fhout; they then carry him to the river, wafh him, return, and drefs him in his war drefs; which done, the women carry the bride to her own *Chaung*, where fhe is put in the centre; and, notice of this being brought to the vifitors at the bridegroom's houfe, they take up the wine, &c. and prepare to go with the bridegroom, when his father, mother, and family, cry and howl in the moft lamentable manner, and fome force is ufed to feparate him from them. At laft they depart, the bride's

3 I father

father leading the way, and the company following one by one, the bridegroom in the centre. On entering the bride's *Chaung*, they make a general ſhout, and place the bridegroom on the bride's right-hand, and then ſing and dance for a time, till the prieſt proclaiming ſilence, all is quiet; and he goes before the bride and bridegroom, who are ſeated, and aſks ſome queſtions, to which the whole party anſwer *Nummah*, or *good* *; this continues a few minutes, after which, the cock and hen being brought, the prieſt takes hold of them by the wings, and holds them up to the company, aſking them ſome queſtions, to which they again reply *Nummah*; ſome grain is then brought, and thrown before the cock and hen, who being employed in picking it, the prieſt takes this opportunity to ſtrike them on the head with a ſtick, to appearance dead, and the whole company, after obſerving them a few ſeconds, calls out as before; a knife being then brought, the prieſt cuts the anus of the cock, and draws out the guts, and the company repeat *Nummah*, after which he performs the ſame operation on the hen, and the company give a ſhout, and again call out *Nummah*. They look on this part of the ceremony as very ominous; for ſhould any blood be ſpilt by the firſt blow, or the guts break, or any blood come out with the guts, it would be conſidered as an unlucky marriage, The ceremony being over, the bride and bridegroom, drinking, preſent the bowl to the company, and then they all feaſt and make merry.

I diſcovered theſe circumſtances of the marriage ceremony of the *Garrows*, from being preſent at the marriage of LUNGREE, youngeſt daughter of the chief OODASSY, ſeven years of age, and BUGLUN, twenty-three years old, the ſon of a common *Garrow*; and I may here obſerve, that this marriage, diſproportionate as to age and rank, is a very happy one for BUGLUN, as he will ſucceed to the *Booneahſhip* and eſtate; for among all the *Garrows*, the youngeſt daughter is always heireſs, and, if there be any other children, who were born before her, they would get nothing on the death of the *Booneah*: what is more ſtrange, if BUGLUN were to die, LUNGREE would marry one of his brothers; and, if all his brothers were dead, ſhe would then marry the father: and, if the father afterwards ſhould prove too old, ſhe would put him aſide, and take any one elſe, whom ſhe might chuſe.

The dead are kept four days, burnt on a pile of wood in a *Dingy* or ſmall boat, placed on the top of the pile, and the aſhes are put into a hole dug exactly where the fire was, covered with a ſmall thatch building, and ſurrounded with a railing:

* I ſuſpect the word to be *Namah* or *ſalutation* and *reverence*. J.

a lamp

a lamp is burnt within the building every night, for the ſpace of a month or more; the wearing apparel of the deceaſed is hung on poles fixed at each corner of the railing, which, after a certain time (from ſix weeks to two months) are broken, and then allowed to hang downwards till they fall to pieces: they burn their dead within ſix or eight yards of their *Chaungs*, and the ceremony is performed exactly at twelve o'clock at night; the pile is lighted by the neareſt relation: after this they feaſt, make merry, dance and ſing, and get drunk. This is, however, the ceremony to a common *Garrow*. If it be a perſon of rank, the pile is decorated with cloth and flowers, and a bullock ſacrificed on the occaſion, and the head of the bullock is alſo burnt with the corpſe: if it be an upper hill *Booneah*, of common rank, the head of one of his ſlaves would be cut off, and burnt with him; and if it happen to be one of the firſt rank *Booneahs*, a large body of his ſlaves ſally out of the hills, and ſeize a *Hindu*, whoſe head they cut off, and burn with their chief. The railed graves of *Booneahs* are decorated with images of animals placed near the graves, and the railing is often ornamented with freſh flowers.

Their religion appears to approximate to that of the *Hindus*: they worſhip MAHADE'VA; and at *Baunjaun*, a paſs in the hills, they worſhip the ſun and moon. To aſcertain which of the two they are to worſhip upon any particular occaſion, their prieſt takes a cup of water and ſome wheat: firſt calling the name of the ſun, he drops a grain into the water; if it ſinks, they are then to worſhip the ſun; ſhould it not ſink, they then would drop another grain in the name of the moon, and ſo on till one of the grains ſink. All religious ceremonies are preceded by a ſacrifice to their god of a bull, goat, hog, cock, or dog; in caſes of illneſs, they offer up a ſacrifice in proportion to the ſuppoſed fatality of the diſtemper, with which they are afflicted; as they imagine medicine will have no effect, unleſs the Deity interfere in their favour, and that a ſacrifice is requiſite to procure ſuch interpoſition.

The ſacrifice is made before an altar conſtructed as follows: two bamboos are erected, ſtripped of all their branches and leaves, except at the extremity of the main ſtem, which is left: a ſtick is fixed near the top of each, to which is tied, at each end, a double ſtring, reaching to two ſide bamboos, about two feet out of the ground, with the tops ſplit, ſo as to make a kind of crown; between the ſtrings are placed bits of ſticks of about a foot in height, at the diſtance of a foot from each other, or more, in proportion to the height of the bamboos. The croſs ſticks thus form a ſquare, with the perpendicular ſtrings, and in every other ſquare, croſs ſtrings are tied, beginning with the top ſquare: round the bamboos a ſpace of ſix

or

or eight feet ſquare is cleared, and covered with red earth; and in front, at the diſtance of about ſix or more feet, a ſquare of two feet is cleared, in the centre of which a ſmall pit is dug, and ſpread over with red earth ; at ſome diſtance from the altar, on the ſide neareſt the hills, two ſplit bamboos are bent into an arch, with the ends in the ground, ſo as to form a covering ; under this a ſmall mound is raiſed, and a little thatched building erected over it, open at the ſides, under which ſome boiled rice is placed. When thus much is prepared, the prieſt approaches the little pit, and the people aſſembled ſtand behind him. He then mutters ſomething to himſelf; when the animal, intended to be ſacrificed, is brought, and the head cut off by the prieſt over the pit, ſome holding the head by a rope, and others the body : if the head is not taken off at one blow, it is reckoned unlucky. The blood is collected in a pan, carried to the covered arch, with the head of the animal, and put by the ſide of the mound. A lighted lamp is then brought, and put near the animal's head, when the whole company bow to the ground, and a white cloth is drawn over the arch, it being ſuppoſed their god will then come, and take what he wants ; a fire is alſo kept burning during the ceremony between the altar and arch. An hour after, the covering is taken off, the proviſions therein placed, with the animal, are dreſſed for the company, and they make merry.

When a large animal is to be ſacrificed, two ſtaves are put by the ſide of the pit, ſo as to place the animal's neck between them : a bamboo is tied under his neck to the ſtaves, to prevent his head from falling to the ground: he is then ſtretched out by ropes, fixed to his legs, and his head is ſevered by the ſtrongeſt man among them.

Their mode of ſwearing at *Ghoſegong* is very *ſolemn* : the oath is taken upon a ſtone, which they firſt ſalute, then with their hands joined and uplifted, their eyes ſtedfaſtly fixed to the hills, they call on MAHADE'VA in the moſt ſolemn manner, telling him to witneſs what they declare, and that he knows whether they ſpeak true or falſe. They then again touch the ſtone with all the appearance of the utmoſt fear, and bow their heads to it, calling again upon MAHADE'VA. They alſo, during their relation, look ſtedfaſtly to the hills, and keep their right hand on the ſtone. When the firſt perſon ſwore before me, the awe and reverence with which the man ſwore, forcibly ſtruck me; my *Moherrir* could hardly write, ſo much was he affected by the ſolemnity. In ſome of the hills they put a tiger's bone between their teeth, before they relate the ſubject to be depoſed ; others take earth in their hand; and, on ſome occaſions, they ſwear with their weapons in their hands. I under-

ſtand

ſtand their general belief to be, that their God reſides in the hills; and, though this belief may ſeem inconſiſtent with an awful idea of the divinity, theſe people appeared to ſtand in the utmoſt awe of their deity, from their fear of his puniſhing them for any miſconduct in their frequent excurſions to the hills.

Their puniſhments conſiſt moſtly in fines. The *Booneahs* decide on all complaints, except adultery, murder, and robbery, which are tried by a general aſſembly of the neighbouring chiefs, and are puniſhed with inſtant death. As the money collected by fines was appropriated to feaſting and drunkenneſs, I wiſhed to ſee if I could induce them to give over this mode of puniſhing; but they told me plainly, they would not allow me to interfere; yet, as I had been very kind to them, when a man was to be puniſhed with death, they would let me know.

When any thing particular is to be ſettled, they all aſſemble in their war-dreſs, which conſiſts of a blue cloth (covering part of the back and tied at the breaſt, where the four corners are made to meet), a ſhield, and a ſword; they ſit in a circle, the ſword fixed in the ground before them. Their reſolutions are put into immediate execution, if they relate to war; if to other matters, they feaſt, ſing, dance, and get drunk.

Their chiefs debate the ſubject of deliberation, and their wives on theſe occaſions have as much authority as the chiefs. This I had an opportunity of ſeeing, when I ſettled the revenue they had to pay, having told them they would be well protected from any oppreſſion while under me; and that no more ſhould be taken from them, than was finally ſettled: ſome of the chiefs wiſhed to pay an inadequate ſum, when MOMEE, wife to the principal chief, roſe, and ſpoke for ſome minutes, after which ſhe aſked me if I declared the truth to them, and on my replying in the affirmative, they agreed to the revenue I demanded: SUJANI, wife of another chief, then came to me, and told me I had heard what ſhe ſuffered from the oppreſſion of the *Zemindars*, and begged, with tears in her eyes, that I would get juſtice done to her. I made a particular inquiry into her complaint, and made the *Darogah* of the paſs reſtore her cattle; and ſo much confidence had they at laſt in me, that they requeſted I would make a fair diviſion of their lands, which they would never ſuffer the *Zemindar* or his people to do.

Their mode of ſettling their proportions of payments, &c. is by ſticks: each of the inferior *Garrows* places as many ſticks in a pan, as he can give of the article required: the whole are then counted, and the deficiencies made up by the *Booneahs*; all their accounts alſo are kept by ſticks, as well as their agreements.

I have

I have before ſaid, on occaſions of illneſs, a ſacrifice is made to the deity: I endeavoured to find out what medicines they uſe, but I cannot ſay I have been ſucceſsful in this material point: I imagine, however, they muſt have ſome valuable plants, from the many great cures that appear to have been effected in wounds. The *neem* leaf ſeems to be much uſed in inflammations, and blue vitriol is applied to freſh wounds: this laſt medicine appears to have been introduced by the natives of *Bengal*; charms and ſpells are common among the *Garrows*. The tiger's noſe ſtrung round a woman's neck, is conſidered as a great preſervative in child-birth: they aver, it keeps off giddineſs and other diſorders conſequent on this event. A woman, for nearly a month before her time, is not permitted to ſtir out of her *Chaung:* ſix days after delivery ſhe and her child are carried to the river and bathed.

The ſkin of the ſnake, called the *Burrawar*, is eſteemed a cure for external pains, when applied to the parts affected.

Inoculation is common among the *Garrows*, but this appears to have been only of late years, and was introduced among them by JOYNARAIN *Zemindár* of *Sheerpour*, through the interference and recommendation of ſome of the hill traders, who, having been in the hills at a time when the *Garrows* were afflicted with this fatal diſorder, and dying without being able to aſſiſt themſelves, perſuaded the chiefs to ſend a deputation to the *Zemindár*, and he ſent them his family doctor, who is repreſented to have been very capable, and, by his ſkill, introduced inoculation among the *Garrows*; and this induced them to provide themſelves yearly with an inoculator, whom they reward in the moſt liberal manner, and take as much care of, while he reſides among them, as if he were their father. The inoculator is obliged to obtain from the *Zemindár* a *ſunnud*, permitting him to go into the hills, and for which he pays a very handſome fee; but the *Zemindár* is very cautious whom he permits to go into the hills to officiate on theſe occaſions.

Among the *Garrows* a madneſs exiſts, which they call transformation into a tiger, from the perſon who is afflicted with this malady walking about like that animal, ſhunning all ſociety. It is ſaid, that on their being firſt ſeized with this complaint, they tear their hair and the rings from their ears, with ſuch force as to break the lobe. It is ſuppoſed to be occaſioned by medicine applied to the forehead; but I endeavoured to procure ſome of the medicine, thus uſed, without effect: I imagine it rather to be created by frequent intoxications, as the malady goes off in the courſe of a week or a fortnight; during the time the perſon is in this ſtate, it is with the utmoſt difficulty he is made to eat or drink. I queſtioned a man, who had thus been afflicted,

afflicted, as to the manner of his being seized, and he told me he only felt a giddinefs without any pain, and that afterwards he did not know what happened to him.

The language of the *Garrows* is a little mixed with the *Bengáli:* a few words of it I annex; I had made a tolerable collection for a vocabulary, but unfortunately I loft it, by one of my boats finking in the *Berhampooter*.

To drink,	ring,bo.
eat,	cha,fuch.
bathe,	ha,boo,ah.
wafh,	fu,fuck.
fight,	den,juck.
wound,	ma,juck.
come,	ra,ba,fuck.
go,	ree.
call,	gum,ma.
fleep,	fee,fuck.
run,	ca,tan,juck.
bring,	rap,pa.
fit,	a,jen,juck.
a man,	mun,die.
a woman,	mee,che,da,rung.
a child,	dooĕĕ.
head,	fee,kook.
face,	moo,kam.
nofe,	ging.
mouth,	chu,chul.
eye,	mok,roon.
ear,	ner,chil.
hair,	ke,nil.
hand,	jauck.
finger,	jauck,fee.
back,	bick,ma.
foot,	ja,chuck.
fire,	waul.

water,

water,	chee.
houſe,	nuck.
tree,	ber.
rice,	my,run.
cotton,	caule.
hog,	wauck.
cow,	ma,ſhu.
wine,	pa,ta,ka.
ſalt,	ſoom.
cloth,	ba,ra.
dog,	aa,chuck.
plenty,	gun,mauck.
good,	num,mah.
ſword,	dig,ree.
ſhield,	too,pee.
graſs,	cau,pun.

At the foot of the hills reſide a caſt of people called *Hajins*; their cuſtoms nearly reſemble the *Garrows*; in religious matters they partake more of the *Hindus*, as they will not kill a cow: their habitations are built like the houſes of the ryotts in general, but are better made, encloſed with a court-yard, kept remarkably neat and clean, the railing made of bamboos ſplit, flatted, and joined together; the ſtreets of their villages equal the neatneſs of their houſes. The men are of a dark complexion, well made and ſtout; their face nearly reſembles the *Garrow*, though rather of a milder look; their dreſs is the ſame as that of the head peaſants in *Bengal*, conſiſting of a *Dootee*, *Egpautah*, and *Pugree*, or waiſt-cloth, mantle, and turband.

The women are remarkably neat and clean: their dreſs conſiſts of one cloth, made to go near twice round the body, and to hang in folds, down to the ankle, covers their breaſts, and paſſes under their arms, and the ends are tucked in as the waiſt-cloth of the natives of *Bengal*: their hair is tied on the crown, and they have ear-rings in the ſame manner as the *Garrow* women, but no neck ornament.

This is the ſum of the obſervations, which my ſhort ſtay with the inhabitants of the *Garrow* hills enabled me to make on their manners and cuſtoms. I have written ſeparately an account of my journey at the foot of the hills to the different paſſes,

paſſes, where their trade is carried on, from which ſome further information may be derived of their conduct and character; but I am conſcious that my remarks deſcribe them but imperfectly, and found my only hope of their proving acceptable on the people, to whom they relate, having hitherto been wholly unnoticed: they may alſo perhaps lead to more accurate inquiries hereafter.

TO THE PRESIDENT.

Dear Sir,

I NOW have the pleaſure to incloſe a copy, written with a ſtylus on five palmyra-leaves, of the engraving on copper-plates preſerved in the great pagoda of *Conjeveram*; the language is the *Dévavánì*, and the character *Dévanágarì*. Two perſons only at this place can read and expound them: they contain an account of the diviſion of lands, &c. in this country. Thus have I taken the liberty to trouble you with matters which may, or may not, prove of conſequence; they who are able to judge of them muſt determine. Should any good ariſe from theſe communications, my merit will be only that of the ſlave, who digs from a mine the rough diamond, which others, of ſuperior ſkill and capacity, cut and poliſh into its full luſtre and value.

I am, dear Sir,

Your moſt obedient humble ſervant,

ALEXANDER MACLEOD.

Conjeveram, April 7, 1791.

A ROYAL

III.

A ROYAL GRANT OF LAND IN CARNATA.

Communicated by ALEXANDER MACLEOD, *Esq. and translated from the Sanscrit by the President.*

Prosperity attend you!
Adoration to GANE'SA!

STANZAS.

1. ADORED be the God SAMBHU, on whom the city of the three worlds rested in the beginning as on its main pillar, and whose lofty head is adorned with a crescent, that kisses it, resembling the point of a waving *Chámara!*

NOTE.

The comparison is taken from the image of an *Indian* prince, fanned by an officer, who stands behind him, with the tail of a *Chamara*, or wild cow, the hairs of which are exquisitely fine, and of a pale yellow tint. SAMBHU is MAHA'DEVA.

2. May the tusk of that boar, whose form was assumed in sport by HERI, when the raised earth was his gorgeous umbrella with *Hémádri* (or the *golden mountain*) for the ornament of its top, be a staff to keep you secure!

NOTE.

VISHNU, in his *third* incarnation, is allegorically represented as a boar, the symbol of strength, supporting our globe on his tusk, which is here compared to the staff of a *Ch'hatra*, or *Indian* umbrella. The *Ch'hatras* of rich men have an ornament of gold on their summits, called a *Calasa*, to which the royal bard, who wrote the grant, compares the mountain *Suméru*, or the North-pole.

3. May the luminous body of that God, who, though formed like an elephant, was born of PA'RVATI', and is revered even by HERI, propitiously dispel the gloom of misfortune!

NOTE.

The bodies of the *Hindu* gods are supposed to be an *ethereal substance* resembling light; and GANE'SA, or the Divine Wisdom personified, is represented with the head of an *elephant*: his mother was the daughter of the mountain *Himálaya*. This couplet is in the style called *yamaca*, where some of the words have different meanings, but are applicable, in all of them, to the rest of the sentence: thus *Agájá*, or *mountain-born*, may signify the goddess PA'RVATI', but it also means *not a female elephant*; and HERI, or VISHNU, may be translated a *lion*, of which elephants are the natural prey.

4. There

4. There is a luminary, which rose, like fresh butter, from the ocean of milk churned by the gods, and scattered the gloom from around it.

NOTE.

After the usual stanzas, called *mangala*, or *auspicious*, we are presented with the pedigree of the donor, beginning with the Moon, who, in the *second* incarnation of VISHNU, was produced from the sea of milk. A comparison of the moon to *butter* must seem ridiculous to *Europeans*; but they should consider, that every thing, which the *cow* produces, is held sacred by the *Hindus*; and the simile is consistent with the allegory of a *milky* ocean *churned* by the deities.

5. The offspring of that luminary was BUDHA, or the Wise, with reason so named from his unequalled acts of devotion and eminent virtues: the son of BUDHA was PURU'RAVAS, by the force of whose arm the lives of his foes were destroyed: his son was A'YUS; his, NAHUSHA; his, the hero YAYA'TI, famed through the world in battle; and from him, by his happy consort DE'VAYA'NI', came TU'RVASU, equal to a God.

NOTE.

This pedigree is conformable to the *Purānas*. BUDHA was probably an old philosopher and legislator, highly revered, while he lived, and supposed after his death to preside over the planet MERCURY; while his father (if that be not an astronomical fable) was conceived to be regent of the Moon: he gives his name, like the WODEN of the north, to the *fourth* day of the week. The original epithet of the last king, named in this verse, is *Vasunibha*, or *equal to a Vasu*; but the jingle of syllables, which the *Indian* poet meant as a beauty, is avoided in the translation. A *Vasu* is one of the *eight* divinities, who form a *gana*, or assemblage, of Gods; and there are *nine* of those *ganas*.

6. In his family was born DE'VACI'JA'NI; and in his, TIMMA, a sovereign celebrated among those of equal descent, like VRISHNI among the children of YADU.

NOTE.

If *Tulavínda* be the true reading in the second hemistich, it must be the name of a kingdom: but we must beware of geographical errors, lest the names of countries, which never existed, should find their way into maps. YADU was another son of YAYA'TI; and CRISHNA descended from him through VRISHNI, whence the Shepherd God is named *Yādava*, and *Vārshnéya*.

7. From him sprang BHUCCAMA'JA'NI, a ruler, who cherished the world; a gem on the head of kings, not spreading terror around, but gleaming with undiminished brightness.

8. He lived with delight; and DE'VACI'NANDANA, the king who gave felicity to mankind, sprang from him, like the God of Love from the son of DE'VACI'.

NOTE.

CA'MADE'VA, or the God of Love, was born in one of his incarnations as the son of CRISHNA, whose real parents were DE'VACI' and VASUDE'VA: in that birth CA'MA took the name of PRADYUMNA, and was father

father of ANIRUDDHA, whose adventures with USHA' are the subject of a beautiful tale and a very interesting drama.

9. In many places, of which *Rámésẃara* was the first, renowned for various exertions of virtue, he distributed, as the law ordains, with a joyful heart again and again, a variety of gifts around the shrines of the deities; attaining such fame on earth, that the inhabitants of the three worlds expanded it in triumphant songs.

NOTE.

Ráméswara near the southern extremity of the *Indian* continent, received its name and sanctity from the *seventh* incarnation of VISHNU in the form of RA'MA. This *ninth* couplet is written in a singular metre, with rhimes in the middle of each division:

Vividha sucritód *dámê rámé* swara pramuc'hé muhur,
Muditahridaya *st'háné st'háné* vyadhatta yat'há vidhi
Vibudhaperitó *náná dáná* niyah bhuvi shodásá,
Tribhuvanajanód *gítam sp'hítam* yasah punaruddhayan.

If *snáné* be the correct reading, it means a sacred bathing-place; and if *shódasa* be properly written at the end of the third line, it may imply, that the royal donations were made to *sixteen* temples; or that the principal donations were *sixteen*.

10. He shone forth conspicuously, having rapidly bound the *Cávérì*, by raising a bridge over that receptacle of tumultuous waters; and having, by the strength of his arm, made JI'VAGRA'HA captive in battle, he appointed that kingdom, of which the name begins with *Srìranga*, as the feudal territory of his prisoner, but subject to his own dominion paramount: he was praised, even to the end of his career, by the three peopled worlds, who heard the whole extent of his fame.

NOTE.

JI'VAGRAHA seems to be the proper name of a prince, whose dominions lay beyond the *Cávérì*: the word means the *Seizer of Life*. Among the many epithets of the god SIVA we find RANGA; and *Srìranga pattan*, or a city dedicated to him, is the capital of *Mahéswar*, so called from another name of the deity. Those appellations are in some measure preserved to this day; but the ancient name of *Travancore* was *Mallára*.

11. Having conquered the regions of *Chéra*, *Chóla*, and *Pánjya*, subdued the king MADHURIVALLABHA, whose chief ornament was his loftiness of mind, taken VI'RYO'DAGRA prisoner, vanquished the king GAJAPETI, or Lord of Elephants, and other sovereigns, he became universally celebrated from the northern banks of *Gangà* to *Lancà* (the equinoctial point) from the verge of the first, or eastern, to that of the last, or western, mountain, and placed his awful behest, like a chaplet of flowers, over the heads of the mightiest potentates.

NOTE.

NOTE.

Two *Bráhmens*, who perufed this couplet, propofed to read *Pándya*, of which they had before heard, inftead of *Pánjya*, which appears in the tranfcript. Had *Madhurá* been written inftead of *Madhurí*, there could have been little doubt, that it meant one of the fouthern kingdoms: one of my *Pandits* thinks, that it means *Madura*.

12. From that chief of lion-like men, by two queens TIPWA'JI' and NAGARA', as from DASARAT'HA by the divine CAUSALYA' and SUMITRA',

13. Sprang two valiant, yet modeft, heroes, like the two princes RAMA and LACSHMANA, named VIRANRISINHENDRA and CRISHNARAYA, both lords of the earth.

14. The famed VIRANRISINHA, having taken his feat in *Vijayanagar*, on a throne blazing with gems, far furpaffed in glory and policy the ancient kings NRIGA, NALA, NAHUSHA, and, confequently, all other monarchs on earth: from the fouthern bridge to *Suméru*, the mountain beautifully extended on this globe, and from the eaftern, to the fartheft extremity of the weftern, hills, he dwelled in the hearts of mankind, and governed his realms with mild fway.

NOTE.

All the kings, named in the three preceding ftanzas, are celebrated in the heroick poems of *India*; and *Vijayanagar*, or the *City of Conqueft*, is very generally known. The epithet *avanifutanutah*, which, if it be the *fifth* cafe, agrees with *Sumeru*, may agree, in the *firft* cafe, with the hero, and fignify *applauded by the fon of the earth*, that is by MANGALA, or the planet MARS, who gives his name to the *third* day of the *Indian* and *Gothick* weeks. TRIVEDI SERVO'RU contends, that it means, *praifed by the fons of the earth*, *or by all men born on it*.

15. He offered many prefents in the Golden Court, in the temple of the three-eyed God, in the city of him, whom CA'LAHASTI' owns as her lord, on the mountain *Vencata*, in *Cánchì*, on the two mountains of *Srì* and *Sóna*, in the great fhrine of HERIHERA, at *Ságarafangama*, *Sríranga*, *Cumbhacóna*, *Níverti*, and *Mahánandi*, that place of pilgrimage, by which the gloom of fin is difpelled.

16. At *Gócarna*, at RA'MA's bridge, and in numberlefs places famed in this world for their virtue, the waters of the fea were dried by the duft fcattered from the hoofs of his galloping fteeds, and the earth herfelf was oppreffed and difturbed by the God, who grafps the thunder bolt, and who felt pain from the obftruction of the ocean, until multiplied force was reftored to the world by the abundant ftreams of his immenfe liberality.

NOTE.

The holy places, enumerated in thefe two ftanzas, are all well known to the *Pandits*, except *Níverti*: the correctnefs of the reading may, therefore, be fufpected. *Hábala*, which my *Nágarì* writer pronounces to be

be *the name of a river*, and which one of my three *Pandits* knows to be a place of pilgrimage, appears on the palm-leaf; but *Ságara* is written above it. If two diſtinct places are intended, we find *ſixteen* in all, agreeably to the *ninth* ſtanza. The firſt meridian of the *Hindus* paſſes through the city of *Ujjayini*, of which we know the poſition; but, as *Lancà*, therefore, falls to the weſt of *Sílán*, which RA'MA's bridge ſeems to mark as the kingdom of RA'VAN, the *Indians* believe that the iſland had formerly a much larger extent; and it has been aſſerted, that appearances between *Sílán* and the *Maldives* in ſome degree juſtify that belief. *Maldive* is, moſt probably, a corruption of *Malayadwípa*, from the promontory of *Malaya* on the continent of *India*.

In the following verſes, which I received from a venerable aſtronomer, *Cánchì* alſo appears in the firſt meridian, and *Ujjayinì* ſeems diſtinct from *Abantì*, though ſome authors inſiſt, that they are one and the ſame city.

Bhúmedhya réc'há canacádrilancá
medhyaſt'hadéſáh cila vatſagulmau,
Cánchí, ſarah ſannihitam, curúnám
cſhétram tat'há pajjanicápyabantí,
Sitáchalaſchójjayiní che déva
canyá che róhítaca gargarátau.

" The places in the meridian line between the *golden mount* and *Lancá*, are *Vatſa*, *Gulma*, *Cánchi*, *Sannihitaſarah*, *Curucſhétra*, *Pajjanicà*, *Abantì*, *Sítáchala*, *Ujjayinì*, *Dévacanyá*, *Róhítaca*, *Gargarát*."

17. The gifts, which he ſpread around were; 1. A *Brahmánda*, or Mundane Egg; 2. A Circle of the Univerſe; 3. A Vaſe repreſenting the five Elements; 4. A Cow formed of Gems; 5. A Figure of the ſeven Seas; 6. Two Sprigs from the Tree of Ages; 7. A golden CA'MADHE'NU, or celeſtial Cow; 8. A Terreſtrial Sphere made of Gold; 9. A Chariot and Horſes of the precious Metals; 10. A Man's Weight of Gold; 11. A thouſand Images of Cows; 12. A golden Horſe; 13. An Image of BRAHMA'; 14. A golden Car; 15. A Plough of Gold, complete in its five Parts; 16. A Car drawn by Elephants of the ſame Metal.

NOTE.

If all this be not a wild poetical exaggeration, and if ſuch preſents were often made by the *Hindu* princes, the *Moghols*, who ſoon after conquered moſt of the ſouthern provinces, muſt have plundered the *Hindu* temples of immenſe treaſures.

18. He was eminently wiſe, and ruled with undiminiſhed magnificence; and, when he aſcended, with the cordial acquieſcence of INDRA, to a celeſtial manſion, leaving behind him the reputation of a king, who reſembled in his great qualities that ruler of the firmament.

19. Then the king CRISHNARA'YA, with irreſiſtible power, bore the round earth on his arm like a bracelet of gems.

NOTE.

NOTE.

This prince, the donor of the land, was probably the younger brother of VI'RANRISINHA, who died, it ſeems, without male iſſue.

20. The Gods had apprehenſions, in the beginning of time, that the glory of ſo great a monarch would rapidly diffuſe one vaſt blaze over the univerſe, and leave them without marks of diſtinction: thence it was, that PURA'RI aſſumed a third eye in his forehead; PEDMA'CSHA, four arms; ATMABHU', four faces; that CA'LI' held a cimeter in her hand; RAMA', a lotos-flower; and VA'NI', a lyre.

NOTE.

The ſix names in the text are appellations of the Gods MAHA'DE'VA, VISHNU, BRAHMA', and the Goddeſſes DURGA', LACSHMI', SERESWATI': they ſignify, in order as they occur, the foe of *Pura* or *Tripura*, the Lotus-eyed, the Self-exiſting, Female Time, the Delightful, and Speech.

21. In the midſt of his aſſembled foes, he darts a conſuming fire kindled by his wrath. Oh! what ſaid I? He dries up the ſeries of ſeven oceans with the duſt and ſand of the whole earth trampled on by the cavalry of his numerous armies, and preſently forms a new range of ſeas, blazing with his meaſureleſs glory, by the unbounded ſtreams of thoſe noble gifts, among which the firſt were a Mundane Egg and a golden figure of *Meru*.

22. "May you long enjoy entire here below the felicity and wealth beſtowed "on you by me!" Thus bleſſing mankind, and well knowing the general obſtacles to an aſcent in the car of the ſun towards the manſion of the gods, he diſtributed in all regions of the world thoſe obeliſks, which confer celebrity, and on which encomiaſtick verſes are engraven by the Goddeſs of Abundance herſelf, that they might become the laſhes of whips to quicken the horſes of the mountains.

NOTE.

The extravagant imagery in this couplet is connected with the old *Indian* cuſtom of raiſing pillars to perpetuate the memory of great events, and with the belief of the *Hindus*, that the ſouls of good men paſs *through the ſun* to their ſeat of happineſs. Although the *Columns of Victory*, as they are called, were monuments of kingly pride or of courtly adulation, yet the poet inſinuates, that the donor intended to facilitate a paſſage to heaven for thoſe whom he had enriched on earth; and the mountains are animated, to become the horſes of the ſun's car, and to be laſhed by the royal obeliſks.

Other columns were erected, perhaps, as *Gnomons*, and others, poſſibly, to repreſent the phallus of ISWARA; but thoſe called *Jayaſtambhas*, or *Pillars of Victory*, ſome of which remain to this day with metrical inſcriptions, are moſt frequently mentioned by the ancient poets of *India*.

23. He proceeded continually, as the law preſcribes, for the attainment of greatneſs and proſperity, to all the terreſtrial ſeats of the Gods and places of pilgrimage, the firſt of which were *Cánchì*, *Sriſaila*, mount *Sóna*, *Canacaſabhà*, or the Golden Court,

Court, and *Véncatádri*; where he diſpenſed many offerings, as a man's weight of gold, and the like, together with all the ſmaller oblations, which are ſpecified in the *Agama*.

NOTE.

The *Agama* is a myſterious book, or ſet of books; part of which has been communicated to me by a *Sannyásì* of *Mat'hurà*: it is ſo named, becauſe it is believed to have *come* from the mouth of SIVA, as the *Vedas* proceeded ſeverally from the four mouths of BRAHMA'. The ſame word means alſo the *Véda*.

24. When he is enraged, he becomes a rod to puniſh guilty ſovereigns: when he aſſumes the arm of SE'SHA, he acts as the chief preſerver of this globe: he ſmiles with a placid cheek, when juſt princes addreſs him; but rages in battle, when he relieves oppreſſed nations who aſk his protection.

NOTE.

SE'SHA is the king of Serpents, the couch of VISHNU, and the ſymbol of Eternity. The meaſure of this rhimed couplet is dactylick, and each of its four diviſions begins and ends with a ſimilar ſound; as,

Róſha critah pretipárt'hiva *danda*
Tóſha cridart'hiſhu yò rana *chanda*.

25. Juſtly is he ſtyled *Rájádhirája*, ſince he is the ſupreme ruler of rulers, offering a mild cheek to the princes of *Múru*, but filling other kings with terror.

NOTE.

The phraſe *ráyaraganda* occurs both in this and in the preceding ſtanza. *Ráya* means a king, not in *Sanſcrit*, but in a popular idiom; and the whole phraſe may be a title in the vulgar dialect of *Carnáta*. It is here preceded by *Múru*, which we ſhall find again towards the end of the grant, and which may, or may not, be the name of a country. Not one of the three *Pandits*, who were conſulted on the meaning of the words *Múru* and *Raganda*, could throw any light on them; except that *Múru* is a territory, of which the derivative is *Maurava*.

26. He is a deliverer of thoſe *Hindu* princes, who act like beneficent genii, but a deſtroyer of thoſe who rage like fierce tigers: thence he receives due praiſes, with the title *Víraprátápa*, or the glory of heroes, and other ſplendid epithets.

NOTE.

The word *Hindu* is applied likewiſe in a verſe of CA'LIDA's to the original inhabitants of this country; but the *Pandits* inſiſt, that it is not *Sanſcrit*. Since the firſt letter of it appears to be radical, it cannot be derived from *Indu*, or the moon; but, ſince a ſibilant is often changed into an aſpirate, it has been thought a variation of *Sindhu* or *Indus*. To that etymology, however, we may object, that the laſt conſonant alſo muſt be changed, and that *Sindhu* is the name of a *river*, not of a *people*.

27. He is revered by the kings of *Anga*, *Benga*, *Calinga*, and others, who exclaim, "Look on us, mighty potentate! Live, and conquer!"

NOTE.

NOTE.

Anga was the ancient kingdom of *Carna,* including the diſtrict of *Bhágalapura.* To the eaſt of *Gaura,* or the *Land of Sugar,* to which we give the name of *Bengal,* lies *Benga,* properly ſo named. *Calinga,* a word known to the *Greeks,* is the country watered by the *Gódáverì.*

28. Exalted with praiſes by the wiſe, the king CRISHNARA'YA ſits on a throne of gems in *Vijayanagar*, ſurpaſſing in the practice of moral virtue NRIGA and other monarchs: from the centre of the eaſtern, to that of the weſtern, mountain, and from *Hémádri* to the ſouthern bridge, he ſhines with tranſcendent glory, diſpenſing riches and felicity through the world;

29. One thouſand four hundred and forty-eight years of the *Sacábda*, or era eſtabliſhed in memory of SA'LI'VA'HANA, being elapſed;

30. In the year *Vyaya,* in the month of *Puſhya,* when the ſun was entering *Macara*, in the dark fortnight, on the day of BHRIGU, and on that venerable *tit'hi,* the tenth of the moon;

31. Under the conſtellation *Viſác'há,* at a time productive of good fortune, on the banks of the river *Tungabhadrà,* near the temple of the God with three eyes.

NOTE.

The date of the grant follows the genealogy of the donor, and precedes that of the donee; after which comes a deſcription of the land granted, and the religious tenure by which it was to be held. The *Sacábda* began in Y. C. 78, and the grant was made in Y. C. 1526, the very year in which BABUR took poſſeſſion of *Dehli*; or 264 years ago: for, by the almanack of *Navadwipa,* the firſt of *Vaiſác'h* 1712 Y. S. anſwers to 11th *April* 1790 Y. C. The cycle of ſixty is divided into ſets of twenty years, each ſet being ſacred to one of the three divine attributes; and *Vyaya* is the 20th year of the cycle, or the laſt in the part allotted to BRAHMA'. *Macar* is the ſign of *Capricorn,* and *Puſhya,* the 8th lunar manſion. BHRIGU was the father of SUCRA, who preſides over the planet *Venus,* and is properly named BHA'RGAVA; but the day of BHRIGU means Friday.

32. That temple, where prieſts, who have aimed at piety towards ISWARA as their only grandeur, and who ſhine only with the fame of eminent holineſs, fix their heart on the godhead alone;

33. Him, who is an ornament of AGASTYA's race, and whoſe peculiar ſtudies are the *Sác'hás*, or branches, of the *Yajurvéda*; whoſe father was diſtinguiſhed on earth in this age of *Cali*, or contention, by the ſurname of RA'YA;

34. Born in the family of TAMVA, SRI' AILLAPA BHATTA, ſurnamed *Sánc'hyanáyaca*, or chief teacher of the *Sánchya* philoſophy (thus men openly declare his name, his race, and his virtue);

35. Him the king has appointed the difpenfer of nectareous food even here below, to thofe pious ftudents, and, in like manner, his fons and fons' fons to an age without end.

NOTE.

AGASTYA was an ancient fage, now believed to prefide over the ftar *Canopus*.

36. The land called *Sríjayacunda* by the inhabitants of the diftrict of *Chóla*, that named *Méyitcóta* in the principality of *Chandragiri*; that known in *Ambinári* by the name of *Malacà*.

NOTE.

The couplets, containing a defcription of the land, are fo indiftinctly written, that the grammatical conftruction of them can hardly be traced. The firft letter of *Méyitcóta* may belong to the preceding word; and an entire hemiftich feems in this place to be omitted.

It may here be remarked, that this whole grant is conformable to the rules of YA'GYAWALCYA, in whofe work we find the following verfes:

Datwá bhúmin nibandhan và critwà léc'hyantu cárayét,
ágámibhadrauripati perijnyánáya párt'hiwab;
Patévà támrapáttè và fwamudróperichihnitan
abhiléc'hyátmanò vanfyánátmánanchemahípetih.
Pretigrahaperímánán dánach'hédópawernanan,
fwahaftacálafampannan fáfanan cárayétft'hiran.

"Let a king, having given land, or affigned revenue, caufe his gift to be written, for the information of "good princes, who will fucceed him, either on prepared cloth, or on a plate of copper, fealed above with "his own fignet: having defcribed his anceftors and himfelf, the dimenfions or quantity of the gift, with "its metes and bounds, if it be land, and fet his own hand to it, and fpecified the time, let him render his "donation firm."

37. Land, fituated to the eaft of *Tirumápéru*, *Cájómaca*, and fo forth, and the two villages *Cónáru* and *Cóbila*;

38. Placed to the fouth of *Palapúrufha* and *Hulli*, and to the weft of the town called *Parundar*;

39. To the north of *Bérupù* and *Purapácà*, including the town which has the name of *Sivabhactapura*, or that of SIVA's adorers;

40. With another propitious name derived from the four facred hearths *(Chaturvédi)* of the delightful *Chóla*; together with the charming town of *Góvindapári*;

41. Where

41. Where eleven *Bráhmens* are to water one *Amra* tree, and to worſhip the God RUDRA by day and by night after the preſcribed acts of devotion;

42. And the ſmaller town, called *Chattupácà*, ever abundant in grain, inhabited by men eminently learned, in the great principality of *Paravíru*.

43. A place to be honoured by all, marked on all ſides by four diſtinct boundaries; ſurrounded with rivulets formed by good genii, the pebbles of which are like gems carefully depoſited.

44. Viewed with delight by the diſtant eye, fit to be enjoyed by deities; graced with trees exquiſitely beautiful; having the advantage alſo of ponds, wells, and pools of water with raiſed banks;

45. Frequented by officiating prieſts and attendants, with ſubdued paſſions and benevolent hearts; by deities of different claſſes, and by travellers, who know the *Véda*, and converſe with copiouſneſs:

46. All the land before mentioned has the great prince CRISHNADE'VA, worthy of reverence from the wiſe, given with ſerene joy, having firſt diffuſed a ſtream of gold, ſilver, and gems.

47. Such was the decree of CRISHNARA'YA, to whom belongs the whole earth celebrated by the royal bards; that bountiful king, who is the ſource of all the wealth poſſeſſed by the bards of *Múru*.

48. By the command of the great *Ráya* CRISHNADE'VA, the preſident of his council proclaimed this donation to MRIRA, or ISWARA; and his command is here engraved on plates of copper.

49. The artiſt *Srí* VI'RANA'CHA'RYA, the ſon of MALLANA, wrote on copper this grant of the great prince CRISHNADE'VA.

50. As between a gift of land and the confirmation of it by the ſucceſſors of the donor, the confirmation is more meritorious than the gift; by the gift, a king attains a ſeat in heaven; by the confirmation, a ſeat from which he never can fall.

51. The confirmation of a gift by another prince has twice the merit of a gift by himſelf; but the reſumption of land granted by another makes even his own gift fruitleſs.

52. He who reſumes land given either by himſelf or by another, becomes a worm in ordure for ſucceſſive births through a period of ſixty thouſand years.

53. Land, granted for virtuous purpoſes, is in this world the only ſiſter of kings; and conſequently muſt not be enjoyed by them, nor taken by them in marriage.

54. "This

54. " This is the univerſal bridge of virtue for princes, and muſt be repaired by " you from time to time:" thus doth RA'MACHANDRA exhort again and again the ſovereigns of the earth, both thoſe who now live, and thoſe who are to reign hereafter.

SRI' VIRU'PA'CSHA!

OR,

THE GOD WITH THREE EYES!

IV.

ON THE MUSICAL MODES OF THE HINDUS. — *See the Works of Sir William Jones, Vol. I. p.* 413.

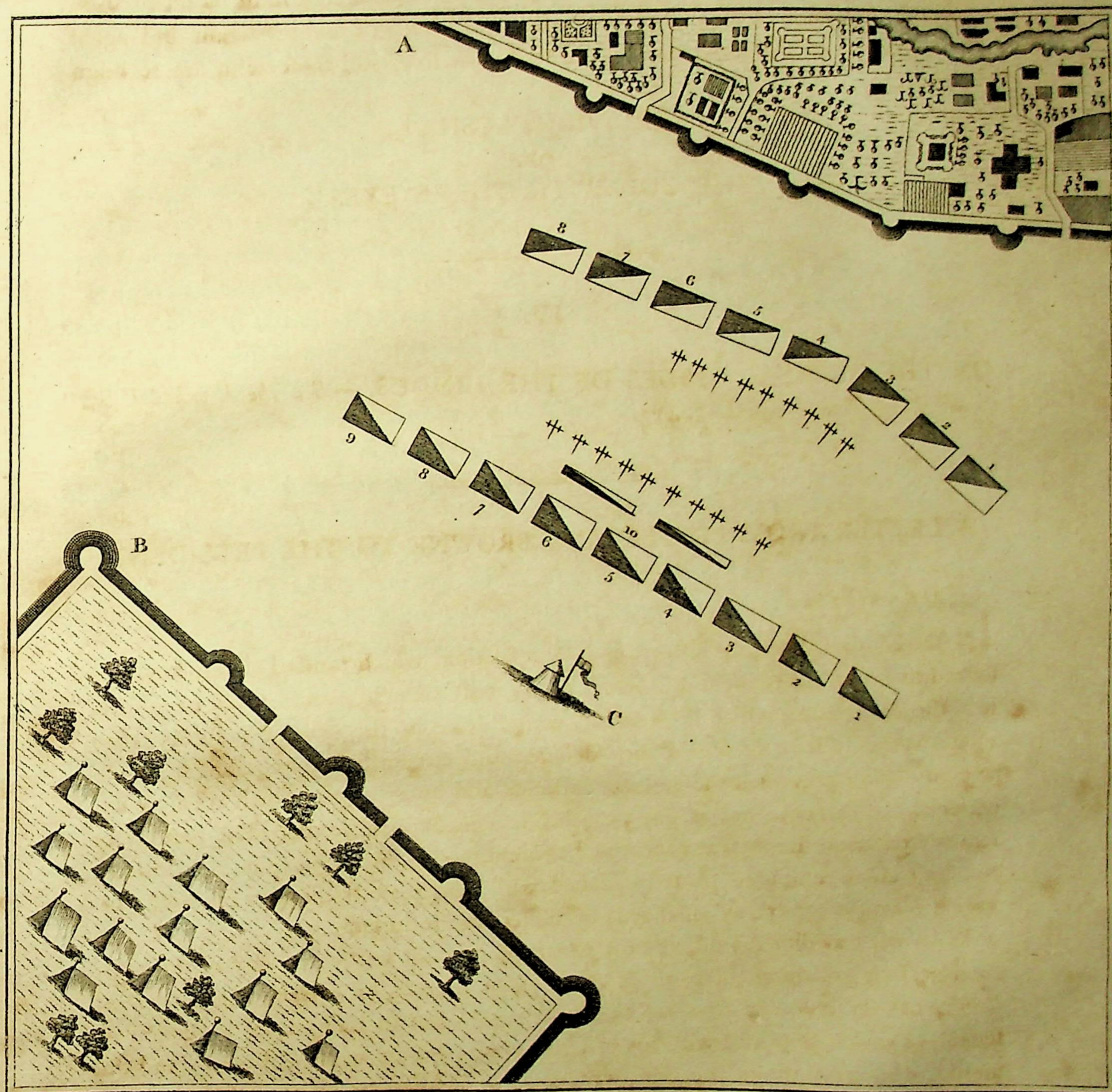
A LETTER FROM LIEUTENANT BROWNE TO THE PRESIDENT.

DEAR SIR,

IN the courſe of reading hiſtory, it is a reflection, which muſt, I think, have occurred to every one, that, if the actors in the moſt material events could have foreſeen the importance, which thoſe events would have in the eyes of poſterity, they would certainly have preſerved ſuch detailed and circumſtantial relations of them, as would have prevented the general darkneſs and uncertainty, which we now experience and lament: but it has probably ſeldom happened, that their genius, or leiſure from more important concerns, has admitted of this; and thus we are from neceſſity often compelled to reſt ſatisfied with imperfect traditions, repeated (or, which is worſe, arbitrarily amended) by ſubſequent hiſtorians.

With what avidity ſhould we now peruſe an account written by any of the principal perſons preſent at the battle of *Haſtings*, of *Lincoln*, of *Lewes*, of *Eveſham*, of *Creſſy*, of *Agincourt*, of *Towton*, or of *Boſworth!* but in thoſe days, a general or ſtateſman was as unſkilful with his pen, as he was expert with his ſword; and the monks, who were almoſt the only writers, were ſeldom participators of ſuch active ſcenes.

Conſidering



Plan of the Battle of Paniput.



Confidering this, as well as the importance, which the wars and politicians of *Hindoftan* have now acquired in the opinions of *European* hiftorians, I cannot avoid believing, that the great events of this country will hereafter be fought for with as much diligence as thofe of the early part of *European* hiftory are at prefent: if I am not miftaken in this, the battle of *Paniput* will be among thofe events, which will claim the greateft attention, both as a military action, and as an era, from which the reduction of the *Mahratta* power may be fixed, who otherwife would probably have long ago reduced the whole of *Hindoftan* to their obedience.

It appeared to me in this light at a time, when a very particular and authentick narrative of that action came into my poffeffion: and, as the plainnefs of the original led me to believe myfelf competent to the tafk, I was induced to undertake the tranflating it into *Englifh*, that the difficulty in reading it in the *Perfian* might not prevent its being as generally known as its hiftorical importance merits.

It is almoft fuperfluous to tell you, dear Sir, who are fo well verfed in *Afiatick* hiftory, that this battle was fought in the month of *January* 1761, between the united forces of all the *Mahratta* chiefs on one fide, commanded by SEDASHEO, (commonly called the BHOW) and the combined armies of the *Durranies*, *Rohillas*, and *Hindoftany Muffulmans*, on the other, under the command of AHMED SHAH DURANNY: few battles have been more bloody, or decifive of greater events; for, had the *Mahrattas* been conquerors, they would have put a final period to the *Muffulman* dominion in *Hindoftan*, and eftablifhed their own in its place; but, as it happened, the power of the *Mahrattas* received a fhock, from which it has never entirely recovered; and the DURANNY SHAH, having returned precipitately to his own dominions, left the difunited *Rohillas*, and *Hindoftany Muffulmans* to carry on, as they could, their diftracted government, under a wretched pageant of royalty, and a divided and unprincipled nobility.

The writer of this narrative, CASI RAJ PUNDIT, was a *Muttafeddy* in the fervice of the late Vizier, SHUJA-UL-DOWLAH; and, being by birth a native of the *Decan*, acquainted with the *Mahratta* language, and having fome friends in the fervice of the BHOW, he became the channel of feveral overtures for peace, which the BHOW endeavoured to negociate through SHUJA-UL-DOWLAH: this, together with the accuracy and clearnefs of his narrative, makes it much more interefting than any other which I have feen. The tranflation is however far from literal, as I endeavoured to make the ftyle as plain and unadorned as poffible.

Such as it is, permit me, dear Sir, to offer it to you, and to leave it to your dif-

pofal:

pofal: if I am fo happy as to know, that it receives your approbation, as likely to prove ufeful in elucidating the hiftory of this country, I fhall think myfelf fufficiently rewarded for the time it has taken up. Believe me to be, with the greateft efteem and refpect,

Dear Sir,
Your very faithful
and obedient fervant,
JAMES BROWNE.

Dinapore, February 1, 1791.

V.

AN ACCOUNT OF THE BATTLE OF PANIPUT,

AND OF THE EVENTS LEADING TO IT.

Written in Perfian by CA'SI RAJA PUNDIT, *who was prefent at the Battle.*

BALA ROW, *Pundit pradhán*, who fat on the *Mufnud* of government in the *Decan*, was confidered by the chiefs and inhabitants of *Hindoftan* as a man of wifdom, circumfpection, and good fortune: but he naturally loved his eafe and pleafure, which did not however lofe him the refpect and attachment of his people.

As long as harmony prevailed in his family, he left the entire management of all the affairs of government to SEDASHEO * ROW BHOW, and gave himfelf up to pleafure.

SEDASHEO, from his earlieft years, had ftudied every branch of the art of government, the regulation of the finances and the army, and the conduct of all publick affairs, under the inftruction of RAMCHUNDRA BABA *Sindhvi*, the greateft ftatefman of the age; and from the firft watch of the day till the middle of the night, applied to the publick bufinefs. By his great experience, addrefs, and ability, he brought men over to his opinion, to a co-operation in his meafures, and a perfect reliance upon his wifdom and ability. Several important affairs both in the *Decan* and the provinces had been brought to a conclufion by his means; and at length an expedition was fitted out for completing the conqueft of *Hindoftan*, under

* Properly, *Sadáfiva*.

the

the ſupreme command of RAGHUNAUT ROW. MULHAR ROW HULKAR, JUNKOOGEE SINDIA, and ſeveral other chiefs, were ordered to act under him with very powerful forces. They accordingly marched into *Hindoſtan*, and with little difficulty reduced every place to their obedience, until they came to the neighbourhood of *Lahore* and *Shahdowla*: here they were oppoſed by JEHAN KHAN and the other commanders left in thoſe diſtricts by AHMED SHAH DURRANNY, whom they defeated and compelled to repaſs the *Attock*. They kept poſſeſſion of that country for ſome time, but the army beginning to fall conſiderably in arrears, RAGHUNAUT ROW thought it adviſable to return to the *Decan*.

Upon the return of RAGHUNAUT ROW, the accounts of his expedition being inſpected by the BHOW, it was found that a debt of eighty-eight lacs of rupees was due to the army, ſo much had the expences been allowed to exceed all the collections of tribute, *piſhcuſh*, &c. The BHOW, who was in every reſpect ſuperior to RAGHUNAUT, reproached him ſeverely for this, and aſked him if that was his good management, to bring home debts inſtead of an increaſe of wealth to the treaſury of the ſtate: which RAGHUNAUT ROW replied to, by adviſing him to try his own ſkill next time, and ſee what advantage he could make of it. BALLA ROW however interfered, and reconciled them in ſome degree, by excuſing RAGHUNAUT ROW on account of his youth and inexperience.

Next year the ſcheme of reducing *Hindoſtan* being renewed, and the command again offered to RAGHUNAUT ROW, he declined it, ſaying, " Let thoſe have the " command who are well-wiſhers to the ſtate, and who will conſult the public ad- " vantage." This ſpeech gave great offence to the BHOW, and, on many conſiderations, he offered himſelf to take the command of the expedition; taking with him BISWAS ROW, the eldeſt ſon of BALA ROW, then ſeventeen years of age, as the nominal commander in chief, according to the ancient cuſtom of the *Mahrattas* *. The army under his command was very numerous, and they ſet out on their expedition without delay; but, as ſoon as they had paſſed the *Nerbudda* †, the BHOW began to exerciſe his authority in a new and offenſive manner, and both in ſettling the accounts of the army and revenue, and in all publick buſineſs, he ſhowed a capricious and ſelf-conceited conduct. He totally excluded from his council MULHAR ROW, and all the other chiefs, who were experienced in the affairs of *Hindoſtan*, and who had credit and influence with the principal people in that country, and carried on every thing by his own opinion alone.

* Properly *Maháráſhtras*.

† Properly *Nermada*.

When

When he came to *Seronga,* he dispatched *Vakeels* with presents to all the principal chiefs in *Hindostan,* inviting them to an alliance and co-operation with him, for the purpose of settling the affairs of *Hindostan.* Among the rest a *Vakeel* came with the above proposal to the *Navab* SHUJAH-UL-DOWLAH, bringing with him a present of fine cloths and jewels, to a considerable amount; and informing him at the same time, that whenever the BHOW should arrive near him, he would dispatch NAROO SHUNKER to conduct SHUJAH-UL-DOWLAH to him. SHUJAH-UL-DOWLAH answered him in the language of profession, but determined in his own mind to keep himself disengaged from both parties, and to be a spectator of the expected contest till his future conduct should be determined by the event, when he designed to join the victors.

AHMED SHAH DURRANY, after the defeat of DATTEA JEE PUTUL SINDIA, cantoned his army in the district of *Anufshair*, upon the banks of the *Ganges*; and DATTEA JEE PUTUL himself having been killed in an action with NUJEIB-UL-DOWLAH, the latter was apprehensive of the consequences of the resentment of the *Mahrattas*, and therefore united himself closely with the DURANNY SHAH, who was himself excited to invade *Hindostan* by a wish to revenge the defeat of his General JEHAN KHAN the preceding year, but still by the solicitations of NUJEIB-UL-DOWLAH, who agreed to bear the extra charges of the SHAH'S army, and, being himself a man of great military reputation, as well as an able politician, had persuaded all the *Rohilla* chiefs and the *Patans* of *Ferokhabad* to join the DURRANNY SHAH.

The BHOW, besides his own *Decany* troops, had brought with him all the auxiliaries that he could collect in *Malwa*, *Jansye*, &c. under the command of the several *Aumils*, such as NAROO SHUNKER and others; and, as soon as he arrived at the river *Chumbul,* he sent a confidential person to *Raja* SURJA MUL, chief of the *Jauts*, proposing a conference, and that SURJA MUL should enter into alliance with him. SURJA MUL sent him word in reply, that his negociations with the *Mahrattas* had always been conducted through the mediation of MULHAR ROW and the SINDEAS, and that, if they chose to interfere on the present occasion, he was ready to wait on the BHOW. The BHOW from necessity asked those chiefs to assist him in this matter, which they having consented to, as soon as the army of the *Mahrattas* approached to *Agra*, SURJA MUL paid his respects to the BHOW; and the conversation turning on the most advisable mode of conducting the war, SURJA MUL said, " You are the master of *Hindoston*, possessed of all things; I am " but

" but a *Zemindar*, yet will give my advice according to the extent of my compre-
" henſion and knowledge. In the firſt place, the families of the chiefs and ſoldiers,
" the large train of baggage, and the heavy artillery, will be great impediments to
" carrying on the kind of war which you have now in hand. Your troops are
" more light and expeditious than thoſe of *Hindoſtan*; but the *Durranies* are ſtill
" more expeditious than you. It is therefore adviſable to take the field againſt
" them quite unincumbered, and to leave the ſuperfluous baggage and followers
" on the other ſide of the *Chumbul*, under the protection of *Janſye* or *Gualiar*;
" which places are under your authority.

" Or, I will put you in poſſeſſion of one of the large forts in my country, *Dieg*,
" or *Combeir*, or *Burtpoor*, in which you may lodge the baggage and followers;
" and I will join you with all my forces. In this arrangement you will have the
" advantage of a free communication with a friendly country behind you, and need
" be under no apprehenſions reſpecting ſupplies to your army: and there is reaſon
" to believe, that the enemy will not be able to advance ſo far, but will by this plan
" of operations be obliged to diſperſe, without effecting any thing."

MULHAR ROW and the other chiefs approved of this advice, and obſerved,
" that trains of artillery were ſuitable to the royal armies, but that the *Mahratta*
" mode of war was predatory; and their beſt way was to follow the method to
" which they had been accuſtomed; that *Hindoſtan* was not their hereditary poſſeſ-
" ſion, and, if they could not ſucceed in reducing it, it would be no diſgrace to
" them to retreat again. That the advice of SURJA MUL was excellent; and that
" the plan which he propoſed would certainly compel the enemy to retreat, as they
" had no fixed poſſeſſion in the country. That their object for the preſent, there-
" fore, ſhould be to gain time till the breaking up of the rains, when the *Durranies*
" would certainly return to their own country."

Notwithſtanding that all the *Mahratta* chiefs were unanimous in recommending this plan, the BHOW, relying on the ſtrength of his army, and his own courage and ability, would not liſten to it, but ſaid, " that his inferiors had acquired military
" reputation by their actions in that country; and it never ſhould be reproached to
" him, that he, who was the ſuperior, had gained nothing but the diſgrace of acting
" defenſively." And he reproached MULHAR ROW with having outlived his activity and his underſtanding: at the ſame time ſaying " that SURJA MUL was only
" a *Zemindar*; that his advice was ſuitable enough to his rank and capacity, but not
" worth the conſideration of men ſo much his ſuperiors."

Men of wiſdom and experience were ſurprized at this arrogance and obſtinacy in a man who always formerly had ſhown ſo much good ſenſe and circumſpection as the BHOW had done till this expedition: and concluded, that fate had ordained the miſcarriage of their enterprize. Every one became diſguſted by his harſh and offenſive ſpeeches; and they ſaid among themſelves, "It is better that this *Brahmin* "ſhould once meet with a defeat, or elſe what weight and conſideration ſhall we be "allowed?"

The BHOW poſted a body of troops to prevent SURJA MUL from leaving the camp: this alarmed him very much, but, as all the chiefs were of one opinion, MULHAR ROW and the reſt adviſed him not to be haſty, but to act as circumſtances ſhould direct; and, for the preſent, to remain for the ſatisfaction of the BHOW.

After this the BHOW marched from *Agra* to *Dehly*, and at once laid ſiege to the royal caſtle, where YACOOB ALY KHAN (who was nephew to the *Durrany Vizier*, SHAH VULLI KHAN) commanded, and ſummoned him to ſurrender the caſtle, after the batteries had played ſome days. YACOOB ALY KHAN finding that reſiſtance was vain, by the advice of SHAH VULLI KHAN, capitulated through the other *Mahratta* chiefs' mediation, and delivered the caſtle up to the BHOW, who entered it with BISWAS ROW, and ſeized upon a great part of the royal effects that he found there: eſpecially the ceiling of the great hall of audience, which was of ſilver, and made at an immenſe expence, was pulled down and coined into ſeventeen lacks of rupees. Many other actions of the ſame kind were done, and it was generally reported to be the BHOW's deſign to get rid of ſuch of the principal *Hindoſtany* chiefs as ſtood in his way; and, after the DURRANY SHAH ſhould return to his own country, to place BISWIS ROW upon the throne of *Dehly*. This intelligence was brought to the *Navab* SHUJAH-UL-DOWLAH, and it is on his authority that I relate it.

In the mean time the rains ſet in, and the BHOW cantoned his army in *Dehly*, and for twelve coſs round it, reſiding himſelf in the caſtle; while AHMED SHAH DURRANNY remained in cantonments near *Anuſſhair*. NUJEIB-UL-DOWLAH gave him exact information of every thing that paſſed; upon which intelligence the SHAH told him, "that as SHUJAH-UL-DOWLAH was a chief of great weight and "power, and vizier of *Hindoſtan*, it was of the greateſt importance to ſecure him to "their intereſt, and to perſuade him to join them; for that, ſhould he be gained "by the *Mahrattas*, the worſt conſequences muſt ariſe from it. That it was not "neceſſary

" neceſſary that he ſhould bring a large army with him: his coming even with a " few would very conſiderably ſtrengthen their cauſe. That on a former occaſion, " when he (AHMED SHAH) invaded *Hindoſtan*, SHUJA-UL-DOWLAH's father, SUF-" DAR JUNG, had oppoſed him, and been the principal means of his failure. That " no doubt this would make SHUJAH-UL-DOWLAH apprehenſive and ſuſpicious of " him, and therefore NUJEIB-UL-DOWLAH muſt endeavour by every means to get " the better of that obſtacle, leſt SHUJA-UL-DOWLAH ſhould join the oppoſite " party. That this was a negotiation too nice and important to be conducted by " *Vakeels*, or by letters, and that therefore NUJEIB-UL-DOWLAH muſt go himſelf " with a ſmall eſcort, and in perſon prevail on SHUJA-UL-DOWLAH to join " them."

AHMED SHAH DURRANY and his vizier, SHAH VULLI KHAN, ſent written treaties of alliance, and the *Khoran* ſealed with their ſeals, by NUJEIB-UL-DOWLAH, who, taking his leave of the DURRANY SHAH, ſet out with an eſcort of two thouſand horſe, and in three days got to *Mindy Gaut*, on the *Ganges*.

SHUJAH-UL-DOWLAH, ſome time before this, had been encamped on his frontier near the *Ganges*, for the protection of his country, and, receiving information of NUJEIB-UL-DOWLAH's ſudden arrival, he found himſelf under the neceſſity of giving him a meeting, and ſhowing him all the honours which hoſpitality and politeneſs demanded. NUJEIB-UL-DOWLAH ſhowed him the treaties propoſed by the DURRANY SHAH, and gave him every aſſurance and encouragement poſſible, both from the DURRANY SHAH and from himſelf; and explained to him alſo the perils of their own ſituation. " For my own part," ſaid he, " I give over every " hope of ſafety, when I reflect that the BHOW is my declared enemy; but it be-" hoves you alſo to take care of yourſelf, and to ſecure an ally in one of the par-" ties: and, as you know the BHOW bears a mortal hatred to all *Muſſulmans*, " whenever he has the power to ſhow his enmity, neither you nor I, nor any other " *Muſſulman*, will eſcape. Though, after all, the deſtiny of GOD will be fulfilled, " yet we ought alſo to exerciſe our own faculties to their utmoſt. From my friend-" ſhip to you, I have come this diſtance to explain things to you, though averſe " from all unneceſſary trouble. Now conſider and determine. The *Begum* your " mother is capable of adviſing us both: conſult her upon the occaſion, as well as " the reſt of your family, and determine on what you ſhall think beſt."

After conſidering the matter for two or three days, SHUJA-UL-DOWLAH concluded, that it would be very unſafe and improper to join the *Mahrattas:* and to decline

decline the proffered friendſhip of the other party, would be impolitick, eſpecially after their deputing a man of NUJEIB-UL-DOWLAH's rank to him; and would never be forgiven either by the SHAH or the *Rohilla* chiefs. Yet the danger appeared very great, whether the victory ſhould fall to the *Mahrattas* or to the *Durranies*. He at length however determined to follow the advice of NUJEIB-UL-DOWLAH, and to join the DURRANY SHAH. He accordingly diſpatched his women to *Lucknow*, appointed *Raja* BENI BEHADER *Naib Subah* during his abſence, and, ſetting out with NUJEIB-UL-DOWLAH, and arriving at the *Durrany* camp near *Anuſſhair*, was preſented to AHMED SHAH DURRANY, who treated him with the greateſt conſideration and honour, told him that he conſidered him as one of his *own children*; that he had waited for his arrival, and now would ſhew him the puniſhment of the *Mahrattas*, with many proofs of his friendſhip. He at the ſame time proclaimed it through his own camp, that no *Durrany* ſhould preſume to commit any violence or irregularity in SHUJA-UL-DOWLAH's camp: that any one who did, ſhould be put to immediate death; adding, that SHUJA-UL-DOWLAH was the ſon of SUFDER JUNG, the gueſt of AHMED SHAH's family; and that he conſidered him as dear as his own child. The grand vizier SHAH VULLI KHAN, who was a man in the higheſt eſteem and reſpect with all ranks, called SHUJA-UL-DOWLAH his ſon alſo, and treated him with the higheſt diſtinction.

As the common ſoldiers among *Durranies* are ſtubborn and diſobedient, notwithſtanding the SHAH's proclamation, they committed ſome irregularities in SHUJA-UL-DOWLAH's camp: the SHAH hearing of this, had two hundred of them ſeized upon, and, having had their noſes bored through with arrows, and ſtrings paſſed through the holes, they were led in this condition, like camels, to SHUJA-UL-DOWLAH, to be put to death or pardoned, as he ſhould think proper. He accordingly had them releaſed; and from that time none of the *Durrany* ſoldiers made the leaſt diſturbance in SHUJA-UL-DOWLAH's camp.

Soon after this, though the rains were ſtill at their height, the SHAH marched from *Anuſſhair*, and cantoned his army at *Shahdera*, on the bank of the *Jumna*, oppoſite to the city of *Dehly*. Many poſts of the *Mahratta* army were within ſight; but the river was too deep and rapid to be paſſed.

The BHOW ſent BOWANY SHUNKER PUNDIT, a native of *Aurungabad*, and a man of good ſenſe and experience, with ſome overtures to SHUJA-UL-DOWLAH; telling him that there was no ground for enmity between the *Mahrattas* and his Excellency's family; on the contrary, they had formerly given great ſupport and aſſiſtance

ance to SUFDER JUNG, SHUJA-UL-DOWLAH's father. Why then did the *Navab* join their enemies? That their not having long ſince deſired him to join them in perſon, was ſolely owing to their unwillingneſs to give him inconvenience. That now it was by all means neceſſary for him to join them, or at leaſt to ſeparate himſelf from the other party, and to ſend ſome perſon of character and rank, on his part, to reſide within the camp.

Accordingly the *Navab* ſent RAJA DEBYDUT, a native of *Dehly*, who was in his ſervice; a man of great eloquence (whoſe father had been the royal treaſurer during the adminiſtration of the *Syeds*; and he himſelf had been one of the houſehold during the reign of MOHAMMED SHAH) to accompany BOWANNY SHUNKER. The *Navab* alſo ſent ROW CASY RAJ (the writer of this narrative), who had been in the ſervice of SUFDER JUNG, and much favoured by him. His excellency told BOWANY SHUNKER that I (CASY RAJ) was alſo a *Decany*, and introduced me to him in his own preſence; where we ſoon recognized our being of the ſame caſt and country. BOWANY SHUNKER wrote the BHOW word of my being employed in this affair; upon which the BHOW cauſed a lettter to be written to me in the *Decan* language; but as there was ſome deficiency in the form of addreſs, I did not reply to it. The BHOW enquired of BOWANY SHUNKER why I neglected to anſwer his letter; which being explained, he was very angry with his *Munſhy*.

When *Raja* DEBYDUT got to the BHOW's camp, the negociation began; but the BHOW being diſſatisfied with this agent, he ſent BOWANY SHUNKER back to tell SHUJA-UL-DOWLAH that *Raja* DEBYDUT was too unguarded a man to be entruſted with ſecrets of ſuch importance: he therefore deſired the *Navab* would ſend a truſty man entirely to be relied on, and ſend word by him preciſely what ſteps were to be purſued.

At the ſame time other overtures came from MULHAR ROW and *Raja* SURJA MUL, to know what part they ſhould act. All theſe propoſals the *Navab* communicated exactly to NUJEIB-UL-DOWLAH and the grand vizier; and negociated with the *Mahrattas* by their advice.

NUJEIB-UL-DOWLAH threw every obſtacle that he could in the way of peace; but the grand vizier told SHUJA-UL-DOWLAH, that, if a peace could be brought about through his means, it would be better; that he was very willing to forward it, and would engage to obtain the SHAH's concurrence. In fact, he was at this time on but indifferent terms with NUJEIB-UL-DOWLAH.

At length it was reſolved to ſend the eunuch MOHAMMED YACOOB KHAN with their

their propofals to the *Mahrattas*, and to tell them from SHUJA-UL-DOWLAH, that he acknowledged the friendfhip which had always fubfifted between them and him; that however it was neither proper nor practicable for him to join them, but that on every proper occafion he was ready to manifeft his friendfhip, by giving them the beft intelligence and advice; and, fince they afked his opinion in the prefent inftance, he would advife them to avoid attempting any other mode of carrying on the war, than the predatory and defultory one, to which they were accuftomed: or that, if they preferred peace, means fhould be devifed for obtaining it.

They at the fame time wrote to *Raja* SURJA MUL, advifing him to quit the *Mahrattas*, and return to his own country; which advice coinciding with his own opinion, he promifed to follow it.

The BHOW, in anfwer to SHUJA-UL-DOWLAH, acknowledged the kindnefs of his advice and conduct, and promifed to pay attention to what he had faid. That as to peace, he had no caufe of quarrel with the DURRANY SHAH, who might march back to his own country, whenever he pleafed; that all the country on the other fide of the *Attock* fhould remain in the poffeffion of the SHAH, and all on this fide of it fhould belong to the chiefs of *Hindoftan*, who might divide and fettle it as they could agree among themfelves. Or, if this fhould not fatisfy the SHAH, he fhould poffefs as far as *Lahore*. Laftly, he faid, that, if the SHAH infifted on ftill more, he fhould have as far as *Sirhind*, leaving the remainder to the chiefs of *Hindoftan*, as was faid before. With this anfwer, YACOOB KHAN returned.

Two days after this, SURJA MUL, who was encamped at *Bidderpoor*, fix cofs from *Dehly*, by the advice of MULHAR ROW and the other difaffected chiefs, under pretence of changing the ground of his encampment, fent off all his baggage and camp-followers towards his own country, and, when he received intelligence that they had got ten cofs on their way, he followed them with his divifions of troops, and had got a great diftance, before the BHOW heard of his departure. In a day and two nights he marched fifty cofs, and reached the ftrong holds of his own country.

The BHOW made no account of his defection, only faying, that fuch conduct was to be expected from mere *Zemindars*; that his going was of no importance, but rather to be rejoiced at, fince he did not quit them at any time, when they might have relied on him for material fervice.

MAHOMMED YACOOB KHAN, returning to camp, reported all the BHOW's overtures;

tures; but, as neither party were ſincerely in earneſt, the negociation went on but ſlowly.

Meantime, the rains drawing near to an end, the BHOW determined to reduce the ſtrong poſt of *Kunjpoora*, which is ſituated on the banks of the *Jumna*, about fifty coſs above *Dehly*, at that time occupied by about 10,000 *Robillas*, as the poſſeſſion of that place would ſecure his paſſing the river to attack the SHAH. He accordingly marched from *Dehly*, and, arriving at *Kunjpoora*, aſſaulted it with fifteen thouſand choſen men; and after an obſtinate reſiſtance made himſelf maſter of the place, taking the governor DULEIL KHAN, and all the garriſon, priſoners, and delivering up the place to plunder. The DURRANY SHAH had exact intelligence of all this proceeding, and was very deſirous of relieving *Kunjpoora*; but the *Jumna* was yet impaſſable.

Soon after the rains broke up, and the *Duſſura* arrived: the SHAH gave orders, that the day before the *Duſſura*, all the army ſhould be aſſembled for muſter; which being done, he reviewed them himſelf from an eminence in front of the camp.

The *Durrany* army conſiſted of twenty-four *Duſtas* (or regiments), each containing twelve hundred horſemen. The principal chiefs in command under the SHAH, were the grand vizier SHAH VULLI KHAN,—JEHAN KHAN,—SHAH PUSSUND KHAN,—NUSSIR KHAN BELOCHE,—BERKHORDAR KHAN,—*Vizier* ULLA KHAN *Kizelbaſhi*,—MORAD KHAN, a *Perſian Moghol*.—Beſides theſe principal chiefs, there were many others of inferior rank; and of the twenty-four *Duſtas* above-mentioned, ſix were of the SHAH's ſlaves, called *Koleran*.

There were alſo two thouſand camels, on each of which were mounted two muſketeers, armed with pieces of a very large bore, called *Zamburucks*; forty pieces of cannon, and a great number of *ſhuternals*, or ſwivels, mounted on camels: this was the ſtrength of the *Durrany* army.

With the *Navab* SHUJA-UL-DOWLAH there were two thouſand horſe, two thouſand foot, and twenty pieces of cannon of different ſizes:

With NUJEIB-UL-DOWLAH, ſix thouſand horſe, and twenty thouſand *Robilla* foot, with great numbers of rockets:

With DOONDY KHAN and HAFIZ RAHMUT KHAN, fifteen thouſand *Robilla* foot and four thouſand horſe, with ſome pieces of cannon:

And with AHMED KHAN BUNGASH, one thouſand horſe, one thouſand foot, with ſome pieces of cannon, making altogether forty-one thouſand eight hundred horſe,

horſe, and thirty-eight thouſand foot, with between ſeventy and eighty pieces of cannon.

This I know to have been preciſely the ſtate of the *Muſſulman* army, having made repeated and particular inquiries before I ſet it down, both from the dufter (or office) of muſters, and from thoſe by whom the daily proviſions were diſtributed. But the numbers of irregulars who accompanied theſe troops, were four times that number; and their horſes and arms were very little inferior to thoſe of the regular *Durranies*. In action, it was their cuſtom immediately after the regulars had charged and broken the enemy, to fall upon them ſword in hand, and complete the rout. All the *Durranies* were men of great bodily ſtrength, and their horſes of the *Turki* breed; naturally very hardy, and rendered ſtill more ſo by continual exerciſe.

AHMED SHAH DURRANY iſſued orders to his army to be ready to march two days after the muſter.

On the other ſide, the BHOW, having reduced *Kunjpoora*, returned to *Dehly*, and ordered a muſter of his army; when the ſtrength of it appeared to be as follows:

Under IBRAHIM KHAN GARDEE, two thouſand horſe, and nine thouſand ſepoys with firelocks, diſciplined after the *European* manner; together with forty pieces of cannon.

The *Khaſs Pagāh*, or houſehold troops, - - -	6,000 horſe.
MULHAR ROW and HULKER, - - - -	5,000 horſe.
JUNKOOJEE SINDIA, - - - - -	10,000 horſe.
AMAJEE GUICKWAR, - - - - -	3,000 horſe.
JESWONT ROW, POWAR, - - - -	2,000 horſe.
SHUMSHERE BEHADER, - - - -	3,000 horſe.
BELAJEE JADOON, - - - - -	3,000 horſe.
RAJAH BETUL SHUDEO, - - - - -	3,000 horſe.
BULMONT ROW, brother-in-law to the BHOW, and his great adviſer in every thing, - - - -	7,000 horſe.
BISWAS ROW's own Pāgāh, - - - -	5,000 horſe.
ANTAGEE MANKESER, - - - -	2,000 horſe.

There were ſeveral other ſmaller bodies, which cannot now be recollected: the whole army amounted to fifty-five thouſand horſe, and fifteen thouſand foot, including IBRAHIM KHAN's ſepoys.

There

There were alſo two hundred pieces of cannon, and rockets and *ſhuternals* without number.

Beſides theſe, the *Pindary* chiefs, CHURGORY and HOOL SEWAR, had fifteen thouſand *Pindarries* under their authority; and there were two or three thouſand horſe with the *Rhatore* and *Cutchwa* vakeels. Theſe, with five or ſix thouſand horſe more, were left to guard *Dehly*, under the command of BOWANY SHUNKER.

Two days after the *Duſſara*, which was the 17th of *October*, 1760, AHMED SHAH DURRANY marched from his camp, ordering his baggage to follow the army; and marching all night, encamped next day at the ford of *Baugput*, eighteen coſs above *Dehly*. He ſearched in vain for the ford, the river being ſtill very high, and ſeveral horſemen, attempting to paſs, were drowned. The SHAH having faſted and performed religious ceremonies for two days, on the third a ford was diſcovered, but it was very narrow, and on each ſide the water was ſo deep, as to drown whoever went the leaſt out of the proper track.

The troops began to paſs the ford on the 23d of *October*, and the SHAH himſelf paſſed as ſoon as half of his army was on the other ſide. The whole army was completely croſſed in two days; but from their numbers and the great expedition uſed, many people loſt their lives.

As ſoon as the army had croſſed, the SHAH marched towards the enemy, who alſo moved to meet him; and on the 26th of *October*, in the afternoon, the *Herawil* (or advanced guard) of the two armies, met each other near *Sumalkeh Seray*, and an action enſued, in which the *Mahrattas* had the diſadvantage, and retreated at ſunſet with the loſs of near two thouſand men, while not more than one thouſand were killed and wounded on the part of AHMED SHAH. The SHAH's army returned to their camp.

The next day AHMED SHAH moved forward again, and ſo on for ſeveral days ſucceſſively, conſtantly ſkirmiſhing, but ſtill gaining ground on the *Mahrattas*, till they came to *Paniput*, where the BHOW determined to fix his camp, which he accordingly did, and incloſed that, as well as the town of *Paniput*, with a trench ſixty feet wide and twelve deep, with a good rampart, on which he mounted his cannon. The SHAH encamped about four coſs from the *Mahratta* lines; and, as he had always during his march, ſurrounded his camp at night with felled trees, ſo in this camp, which was to remain fixed for ſome time, the abattis was made ſomething ſtronger, and the chiefs encamped in the following order:

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The SHAH in the centre;
On his left, SHUJA-UL-DOWLAH;
On his left, NAJEIB-UL-DOWLAH;
On the right of the SHAH, HAFIZ RAHMUT KHAN;
On his right, DOONDY KHAN;
On his right, AHMED KHAN BUNGUS.

The ſpace occupied by the whole front was near three coſs and a half.

The BHOW had before given orders to GOBIND PUNDIT, who had the command and collections of *Korah*, *Kurrah*, *Etawa*, *Shekoabad*, and the reſt of the *Doab*, as well as of *Kalpee*, and other diſtricts acroſs the *Jumna*, as far as *Saghur*, to collect all the forces he poſſibly could, and to cut off all communication for proviſions from the rear of the SHAH's army. GOBIND PUNDIT having got together ten or twelve thouſand horſe, advanced as far as *Mirhet*, in the rear of the SHAH, and ſo effectually cut off all ſupplies, that the SHAH's army was in the greateſt diſtreſs for proviſions, coarſe flour ſelling for two rupees per ſeer, and the troops conſequently very much diſſatisfied. The SHAH therefore detached ATTAI KHAN, nephew to the grand vizier, with a *Duſta*, conſiſting of two thouſand choſen horſe, and ordered him to march day and night, till he ſhould come up with GOBIND PUNDIT, and having cut off his head, to bring it to the preſence. He ſet out accordingly, being joined by eight or ten thouſand of the irregulars, and having marched about forty coſs during the night, at day break they fell like lightning upon the camp of GOBIND PUNDIT; where, having no intelligence of the *Durranies*' approach, they were ſeized with terror and amazement, and fled on all ſides. GOBIND PUNDIT himſelf attempted to eſcape upon a *Turki* horſe; but being old, and not a very expert horſeman, he was thrown off in the purſuit; and the *Durranies* coming up, cut off his head and carried it to the camp, where it was recognized for the head of GOBIND PUNDIT.

After plundering the enemy's camp, and driving away their ſcattered troops on all ſides, ATTAI KHAN returned to the SHAH's camp, the fourth day from that on which he was detached, and preſented his Majeſty with the head of GOBIND PUNDIT. The SHAH was highly pleaſed with this effectual performance of his orders, and beſtowed a very honourable *Khalat* on ATTAI KHAN. After this action, the *Durrany* army was conſtantly ſupplied with proviſions.

The BHOW was much affected with this news, eſpecially as it was accompanied with other events little favourable to his cauſe: but as he was a man of dignity and reſolution,

resolution, he never betrayed any despondency, but made light of all the adverse circumstances which occurred.

Soon after the defeat of GOBIND PUNDIT, the BHOW sent two thousand horse to *Dehly*, to receive some treasure from NAROO SHUNKER, for the use of the army. These troops were instructed to march privately, by night, and by unfrequented roads, and each man to have a bag of two thousand rupees given him to carry, as far as the sum they should receive would go. They executed their orders completely, as far as to the last march, on their return to the camp; but unluckily for them, the night being dark, they mistook their road, and went strait to the *Durrany* camp instead of their own. On coming to the outposts, thinking them those of their own camp, they began to call out in the *Mahratta* language, which immediately discovering them to the *Durrannies*, they surrounded the *Mahrattas*, cut them to pieces, and plundered the treasures.

From the day of their arrival in their present camp, AHMED SHAH DURRANY caused a small red tent to be pitched for him a cofs in front of his camp, and he came to it every morning before sun-rise; at which time, after performing his morning-prayer, he mounted his horse, and visited every post of the army, accompanied by his son TIMOUR SHAH and forty or fifty horsemen. He also reconnoitred the camp of the enemy, and, in a word, saw every thing with his own eyes, riding usually forty or fifty cofs every day. After noon he returned to the small tent, and sometimes dined there, sometimes at his own tents in the lines; and this was his daily practice.

At night there was a body of five thousand horse advanced as near as conveniently might be, towards the enemy's camp, where they remained all night under arms: other bodies went the rounds of the whole encampment; and AHMED SHAH used to say to the *Hindostany* chiefs, "Do you sleep, I will take care that no harm befalls you:" and to say the truth, his orders were obeyed like destiny, no man daring to hesitate or delay one moment in executing them.

Every day the troops and cannon on both sides were drawn out, and a distant cannonade with many skirmishes of horse took place: towards the evening both parties drew off to their camps. This continued for near three mouths: during this time there were three very severe, though partial, actions.

The first was on the 29th *November*, 1760, when a body of *Mahrattas*, about fifteen thousand strong, having fallen upon the grand vizier's post on the left of the line, pressed him very hard; till a reinforcement coming to his assistance, the action became

became very obſtinate: the *Mahrattas*, however, gave way about ſun-ſet, and were purſued to their own camp with great ſlaughter. Near four thouſand men were killed on the two ſides in this action.

The ſecond action was on the 23d of *December*, 1760, when NUJEIB-UL-DOWLAH having advanced pretty forward with his diviſion, he was attacked with ſo much vigour by BULMONT ROW, that his troops gave way, and only fifty horſemen remained with him; with which ſmall number, however, he kept his ground, till a reinforcement came to his aſſiſtance; the action was then renewed with great fury, and above three thouſand of NUJEIB-UL-DOWLAH's men were killed or wounded. Among the killed was KHALIL-UL-RAHMAN, uncle to NUJEIB-UL-DOWLAH. In the laſt charge, which was at near nine o'clock at night, BULMONT ROW was killed by a muſket-ball: upon which both parties retired to their own camps.

The third action was much in the ſame way; and thus every day were the two armies employed, from morning to nine or ten at night, till at length the *Hindoſtany* chiefs were out of all patience, and entreated the SHAH to put an end to their fatigues, by coming at once to a deciſive action; but his conſtant anſwer was, "This "is a matter of war, with which you are not acquainted. In other affairs do as you "pleaſe, but leave this to me. Military operations muſt not be precipitated. You "ſhall ſee how I will manage this affair; and at a proper opportunity will bring it "to a ſuccefsful concluſion."

As the *Durrany* army was vigilant both by day and night, to prevent the approach of any convoys, there began to be a great ſcarcity of proviſions and forage in the *Mahratta* camp.

One night when about twenty thouſand of their camp-followers had gone out of the lines, to gather wood in a jungle at ſome diſtance, they happened to fall in with a body of five thouſand horſe, under the command of SHAH PUSSUND KHAN, who had the advanced guard that night, and who ſurrounded them on all ſides, put the whole to the ſword, no perſon coming to their aſſiſtance from the *Mahratta* camp. In the morning, when the affair was reported to the SHAH, he went out with moſt of his chiefs to the ſcene of the ſlaughter, where dead bodies were piled up into a perfect mountain!—ſo great had been the deſtruction of thoſe unhappy people.

The grief and terror which this event ſtruck into the *Mahrattas*, is not to be deſcribed; and even the BHOW himſelf began to give way to fear and deſpondence.

There

There was a news-writer of the BHOW's, called GONNEISH PUNDIT, who remained in the camp of the *Navab* SHUJA-UL-DOWLAH; but not being of ſufficient importance to obtain acceſs to the *Navab*, any buſineſs that he had with the *Durbar*, he tranſacted through my means. Through this channel the BHOW often wrote letters to me, with his own hand, deſiring that I would urge the *Navab* to mediate a peace for him, in conjunction with the grand vizier; that he was ready to ſubmit to any conditions, if he could but preſerve himſelf and his army, and would by every means manifeſt his gratitude to the mediators. He alſo ſent a handful of ſaffron (as is a cuſtom with theſe people) and a written engagement (to which he had ſworn) to abide by this promiſe; together with a turban ſet with rich jewels, as an exchange for one to be received from the *Navab*, who alſo returned proper preſents, and promiſed to aſſiſt him.

The *Navab* often ſent me to the vizier upon this buſineſs. He was alſo very well diſpoſed to liſten to the BHOW's propoſals, and ſpoke to the SHAH about it. The SHAH ſaid, "That he had nothing to do in the matter; that he came thither at "the ſolicitation of his countrymen the *Rohillas*, and other *Muſſulmans*, to relieve "them from their fear of the *Mahratta* yoke; that he claimed the entire conduct "of the war, but left the *Hindoſtany* chiefs to carry on their negociations as they "pleaſed, themſelves."

All the other chiefs, HAFIZ RAAMUT KAAN, DOONDY KHAN, and AHMED KHAN BUNGISH, were alſo ſatisfied to make peace with the BHOW; but every one ſtipulated that NUJEIB-UL-DOWLAH muſt alſo be ſatisfied to do ſo, otherwiſe they could not conſent. Accordingly the *Navab* SHUJA-UL-DOWLAH ſent me to talk over the matter with NUJEIB-UL-DOWLAH, and to obtain his conſent. I therefore waited upon him, and, in a long private conference, I explained every thing that had paſſed, and urged every argument to perſuade him to come into the views of the other chiefs: to which he replied in nearly the following words: "SHUJA-UL-"DOWLAH is the ſon of a man, whom I look up to as my ſuperior; and I con-"ſider him alſo in the ſame light; but at the ſame time, he is young and unac-"quainted with the world: he does not ſee to the bottom of things. This buſineſs "is a deception: when an enemy is weak and diſtreſſed, there is no conceſſion "that he will not make, and, in the way of negociation, will ſwear to any thing; "but oaths are not chains, they are only words. After reducing an enemy to this "extremity, if you let him eſcape, do you think he will not ſeize the firſt oppor-"tunity to recover his loſt honour and power? At preſent we may be ſaid to have

"the

"the whole *Decan* at our mercy; when can we hope for another juncture so favourable? By one effort we get this thorn out of our sides for ever.—Let the "*Navab* have a little patience; I will wait upon him myself, and consult what is "best to be done."

After this answer, I left NUJEIB-UL-DOWLAH, and returned to my master, to whom I repeated all that had passed, assuring him that NUJEIB-UL-DOWLAH would never be brought to agree to any terms of pacification.

As soon as I had left NUJEIB-UL-DOWLAH, though it was the middle of the night, he went immediately to the SHAH, and informed him of what had passed. "All the chiefs (said he) are inclined to make peace with the *Mahrattas*, but I "think it by no means adviseable. The *Mahrattas* are the thorn of *Hindostan*; if "they were out of the way, this empire might be your Majesty's whenever you "should please. Do as seems fit to yourself. For my own part, I am a soldier of "fortune, and can make terms with whatever party may prevail."

The SHAH replied, "You say truly: I approve of your counsel, and will not "listen to any thing in opposition to it. SHUJA-UL-DOWLAH is young and inexperienced, and the *Mahrattas* are a crafty race, on whose pretended penitence no "reliance is to be placed. I from the beginning made you the manager of this "affair, act as seems best to yourself: in my situation I must hear every one, but I "will not do any thing against your advice."

Next day NUJEIB-UL-DOWLAH came to SHUJA-UL-DOWLAH's tent, where they consulted till late at night, but without coming to any conclusion.

By this time the distresses in the BHOW's camp were so great, that the troops plundered the town of *Paniput* for grain; but such a scanty supply gave no relief to the wants of such multitudes. At length the chiefs and soldiers, in a body, surrounded the BHOW's tent, and said to him, "It is now two days that we have not "had any thing to eat; do not let us perish in this misery; let us make one spirited "effort against the enemy, and whatever is our destiny that will happen." The BHOW replied, that he was of the same mind and was ready to abide by whatever they should resolve upon. At length it was determined to march out of the lines an hour before day-break, and, placing the artillery in front, to proceed to the attack of the enemy. They all swore to fight to the last extremity; and each person took a *betel*-leaf in the presence of his fellows, in confirmation of this engagement, as is the custom among the *Hindoos*.

In this last extremity, the BHOW wrote me a short note with his own hand, which

which he ſent by one of his moſt confidential ſervants. The words of the note were theſe :—

" The cup is now full to the brim, and cannot hold another drop. If any thing " can be done, do it, or elſe anſwer me plainly at once: hereafter there will be no " time for writing or ſpeaking."

This note arrived about three in the morning, at which time I was with the *Navab*. As ſoon as I had read it, I informed his Excellency of its contents, and called in the man who brought it; who told the *Navab* all that had happened in the *Mahratta* camp. While he was doing this, the *Navab*'s harcarrahs brought word, that the *Mahrattas* were coming out of their lines, the artillery in front, and the troops following cloſe behind.

Immediately on hearing this, his excellency went to the SHAH's tent, and deſired the eunuchs to wake his Majeſty that moment, as he had ſome urgent buſineſs with him.

The SHAH came out directly, and enquired what news: the *Navab* replied, that there was no time for explanation, but deſired his Majeſty to mount his horſe, and order the army to get under arms. The SHAH accordingly mounted one of his horſes, which were always ready ſaddled at the tent-door, and, in the dreſs he then had on, rode half a coſs in front of his camp, ordering the troops under arms as he went along.

He enquired of the *Navab* from whom he had his intelligence; and, he mentioning my name, the SHAH immediately diſpatched one on a poſt-camel to bring me. After I had made my obeiſance, he aſked me the particulars of the news. I replied, that the *Mahrattas* had quitted their lines, and would attack his army as ſoon as it ſhould be light. Juſt at this time ſome *Durrany* horſemen paſſed by, with their horſes loaded with plunder, which they ſaid they had taken in the *Mahratta* camp; and added, that the *Mahrattas* were running away. The SHAH looked at me, and aſked me what I ſaid to that? I replied, that a very ſhort time would prove the truth or falſehood of my report. While I was ſpeaking, the *Mahrattas* having advanced about a coſs and a half from their lines, and got their cannon drawn up in a line, all at once gave a general diſcharge of them.

Upon hearing this, the SHAH, who was ſitting upon his horſe, ſmoking a *Perſian Kallian*, gave it to his ſervant, and, with great calmneſs, ſaid to the *Navab*, " Your " ſervant's news is very true, I ſee." He immediately ſent for the Grand *Vizier* SHAH PUSSUND KHAN, who came accordingly: he ordered SHAH PUSSUND

KHAN

KHAN to take poſt, with his diviſion, on the left of NUJEIB-UL-DOWLAH, and conſequently of the *whole line*; the Grand *Vizier* to take poſt with his diviſion, in the centre of *the line*; and BERKHORDAR KHAN, with ſome other chiefs, with their troops, on the right of HAFIZ RAHMUT KHAN; and AHMED KHAN BUNGUSH, conſequently of the whole line. When this was done, he ordered the trumpets and other inſtruments to ſound to battle.

By this time objects began to be diſcernible; and we could perceive the colours of the *Mahratta* line advancing ſlowly and regularly, with their artillery in front. The SHAH, rode along the front of the line, and examined the order of all the diviſions. He then took poſt, where his little tent was pitched, in front of his camp, but in the rear of the preſent line of battle, and gave orders for the attack to begin.

The *Mahratta* army faced towards the eaſtward, and their order was as follows, reckoning from the left flank of their line:

IBRAHIM KHAN GARDEE,
AMAJEE GUICKWAR,
SHU DEO PATEIL,
The BHOW, with BISWAS ROW and the houſehold troops,
JESWONT ROW POWAR,
SHUMSHERE BEHADER,
MULHAR ROW,
JUNKOOJEE SINDIA, &c.

} Front.

The whole artillery, *ſhuternals*, &c. were drawn up in front of the line.

The *Muſſulman* army faced toward the weſtward, and was drawn up as follows, reckoning alſo from the left flank of their line:

SHAH PUSSUND KHAN,
NUJEIB-UL-DOWLAH,
SHUJA-UL-DOWLAH,
The Grand *Vizier* SHAW VULLI KHAN,
AHMED KHAN BUNGUSH,
HAFIZ RAHMET KHAN,
DOONDY KHAN,
AMIR BEG KHAN, and other *Perſian Moghols*,
BERKHORDAR KHAN,

} Front.

All the artillery and rockets were in front of the line. Behind them were the camels,

camels, mounted by the muſketeers carrying *Zumburucks*, ſupported by a body of *Perſian* muſketeers.

The two armies facing each other rather obliquely, the diviſions of BERKHORDAR KHAN, AMIR BEG, and DOONDY KHAN, were very near to that of IBRAHIM KHAN GARDEE. The plan of the battle here annexed will explain this more clearly than any deſcription in writing can do.

On the 7th of *January*, 1761, ſoon after ſun-riſe, the cannon, muſketry, and rockets, began to play without intermiſſion, yet our army ſuffered but little by them; for the armies continuing to advance towards each other, the *Mahratta* guns being very large and heavy, and their level not eaſily altered, their ſhot ſoon began to paſs over our troops, and fell a mile in the rear. On our ſide, the cannon fired but little, except from the Grand *Vizier*'s diviſion.

As the armies were advancing towards each other, IBRAHIM KHAN GARDEE rode up to the BHOW, and, after ſaluting him, he ſaid, "You have long been diſ-"pleaſed with me, for inſiſting on the regular monthly pay for my people; this "month your treaſure was plundered, and we have not received any pay at all; "but never mind that; this day I will convince you that we have not been paid ſo "long without meriting it."—He immediately ſpurred his horſe, and returning to his diviſion, he ordered the ſtandards to be advanced, and taking a colour in his own hand, he directed the cannon and muſketry of his diviſion to ceaſe firing; then leaving two battalions oppoſed to BERKHORDAR KHAN and AMIR KHAN's diviſion, to prevent their taking him in flank, he advanced with ſeven battalions to attack DOONDY KHAN and HAFIZ RAHMUT KHAN's diviſion with fixed bayonets. The *Rohillas* received the charge with great reſolution; and the action was ſo cloſe, that they fought hand to hand. Near eight thouſand *Rohillas* were killed or wounded, and the attack became ſo hard upon them, that but few of the people remained with their chiefs; not above five hundred, or at moſt a thouſand, with each, after the violence of the firſt charge.

HAFIZ RAHMUT KHAN being indiſpoſed, was in his *palankin*, and ſeeing the deſperate ſtate of affairs, he ordered his people to carry him to DOONDY KHAN, that he might expire in his preſence: while, on the other hand, DOONDY KHAN was giving orders to ſearch for HAFIZ RAHMUT KHAN; for ſo great was the confuſion, that no one knew where another was. The two battalions left to oppoſe the SHAH's flank diviſions, as mentioned above, exerted themſelves very much, and repulſed the *Durranies* as often as they attempted to advance. In this action, which

 laſted

lafted three hours, fix of IBRAHIM KHAN's battalions were almoft entirely ruined, and he himfelf wounded in feveral places, with fpears, and with a mufket-ball. AMAJEE GUICWAR, whofe divifion fupported IBRAHIM KHAN, behaved very well, and was himfelf wounded in feveral places.

In the centre of the line, the BHOW with BISWAS ROW, and the houfehold troops, charged the divifion of the Grand *Vizier*. The *Mahrattas* broke through a line of ten thoufand horfe, feven thoufand *Perfian* mufketeers, and one thoufand camels with *Zumburucks* upon them, killing and wounding about three thoufand of them. Among the killed was ATTAI KHAN, the Grand *Vizier*'s nephew, who had gained fo much honour by the defeat of GOBIND PUNDIT. The divifion gave ground a little, but the Grand *Vizier* himfelf ftood firm, with three or four hundred horfe, and fifty *Zamburuck* camels: he himfelf, in complete armour, difmounted to fight on foot.

The *Navab* SHUJA-UL-DOWLAH, whofe divifion was next, could not fee what was going on, on account of the duft, but finding the found of men and horfes in that quarter fuddenly diminifh, he fent me to examine into the caufe. I found the Grand *Vizier* in an agony of rage and defpair, reproaching his men for quitting him. "Our country is far off, my friends," faid he, "whither do you fly?" But no one regarded his orders or exhortations. Seeing me, he faid, "Ride to my fon "SHUJA-UL-DOWLAH, and tell him, that if he does not fupport me immediately, "I muft perifh." I returned with this meffage to the *Navab*, who faid, that the enemy being fo near, and likely to charge his divifion, the worft confequences might follow to the whole army if he made any movement at that time, which might enable the enemy to pafs through the line.

The *Navab*'s divifion confifted of only two thoufand horfe, one thoufand mufketeers, with twenty pieces of cannon, and fome fwivels: but they ftood in clofe order, and fhowed fo good a countenance that the enemy made no attempt upon it. Once or twice they advanced pretty near, and feemed as if they would charge us; but they did not.

On the left of the *Navab*'s divifion was that of NUJEIB-UL-DOWLAH, who had about eight thoufand *Rohilla* infantry with him, and near fix thoufand horfe. They advanced flowly under cover of a kind of breaft-works of fand, which were thrown up by a great number of *Bildars* who were with them, and who, having finifhed one, advanced the diftance of half a mufket-fhot in front of that, under cover of their own people, and threw up another; to which the troops then advanced, while a third

a third was thrown up in the ſame manner. They had got on above a coſs in this method, and were within a long muſket-ſhot of the enemy, NUJEIB-UL-DOWLAH ſaying, "that it behoved him to exert himſelf, as he was the perſon moſt deeply "intereſted in the event of that day, the reſt being only as viſitors:" and, to ſay the truth, he was a man of ſurpriſing activity and ability.

He was oppoſed by JUNKOOJEE *Sindia*, and between them there was a mortal enmity. As the *Rohillas* had a great number of rockets with them, they fired volleys of two thouſand at a time, which, not only terrified the horſes by their dreadful noiſe, but did ſo much execution alſo, that the enemy could not advance to charge them. Beſides which, the diviſion of SHAH PUSSUND KHAN, was on the right flank of NUJEIB-UL-DOWLAH; and that *Durrany* chief, being a brave and experienced officer, advanced in ſuch good order, that the *Mahrattas* could make no impreſſion on it.

The action continued in nearly this ſtate from morning till noon, and, though we ſuffered leaſt in point of killed and wounded, yet, upon the whole, the *Mahrattas* ſeemed to have the advantage.

About noon the SHAH received advice that the *Rohillas* and the Grand *Vizier*'s diviſions had the worſt of the engagement; upon which he ſent for the *Neſuckchees* (a corps of horſe with particular arms and dreſs, who are always employed in carrying and executing the SHAH's immediate commands), and two thouſand of them being aſſembled, he ſent five hundred of them to his own camp, to drive out by force all armed people whom they ſhould find there, that they might aſſiſt in the action; and the remaining one thouſand five hundred, he ordered to meet the fugitives from the battle, and to kill every man who ſhould refuſe to return to the charge. This order they executed ſo effectually, that after killing a few, they compelled ſeven or eight thouſand men to return to the field. Some were alſo found in the camp, and ſome the SHAH ſent from the reſerve which was with him. Of theſe he ſent four thouſand to cover the right flank; and about ten thouſand were ſent to the ſupport of the Grand *Vizier*, with orders to charge the enemy ſword in hand, in cloſe order, and at full gallop. At the ſame time he gave directions to SHAH PUSSUND KHAN and NUJEIB-UL-DOWLAH, that, as often as the Grand *Vizier* ſhould charge the enemy, thoſe two chiefs ſhould at the ſame time attack them in flank,

About one o'clock theſe troops joined the Grand *Vizier*, who immediately mounted his horſe, and charged the body of the *Mahratta* army, where the BHOW commanded

manded in perſon: SHAH PUSSUND KHAN and NUJEIB-UL-DOWLAH took them in flank at the ſame time, which produced a terrible effect.

This cloſe and violent attack laſted for near an hour, during which time they fought on both ſides with ſpears, ſwords, battle axes, and even daggers. Between two and three o'clock, BISWAS ROW was wounded, and diſmounted from his horſe; which being reported to the BHOW, he ordered them to take him up and place him upon his elephant. The BHOW himſelf continued the action near half an hour longer on horſeback, at the head of his men; when all at once, as if by enchantment, the whole *Mahratta* army at once turned their backs and fled at full ſpeed, leaving the field of battle covered with heaps of dead. The inſtant they gave way, the victors purſued them with the utmoſt fury; and, as they gave no quarter, the ſlaughter is ſcarcely to be conceived, the purſuit continuing for ten or twelve coſs in every direction in which they fled.

Of every deſcription of people, men, women, and children, there were ſaid to be five hundred thouſand ſouls in the *Mahratta* camp, of whom the greateſt part were killed or taken priſoners: and of thoſe who eſcaped from the field of battle and the purſuit, many were deſtroyed by the *Zemindars* of the country. ANTAJEE MANKEESER, a chief of rank, was cut off by the *Zemindars* of *Ferocknagur*.

The plunder found in the *Mahratta* camp was prodigiouſly great: you might ſee one of our horſemen carrying off eight or ten camels, loaded with valuable effects: horſes were driven away in flocks like ſheep; and great numbers of elephants were alſo taken.

Near forty thouſand priſoners were taken alive; of which ſix or ſeven thouſand took ſhelter in the camp of SHUJA-UL-DOWLAH, who poſted his own people to protect them from the cruelty of the *Durranies*: but the unhappy priſoners, who fell into the hands of the latter, were moſt of them murdered in cold blood, the *Durranies* ſaying in jeſt, that, when they left their own country, their mothers, ſiſters, and wives, deſired that, whenever they ſhould defeat the unbelievers, they would kill a few of them on their account, that they alſo might poſſeſs a *merit in the ſight of* GOD. In this manner thouſands were deſtroyed, ſo that in the *Durrany* camp (with an exception of the SHAH and his principal officers) every tent had heads piled up before the door of it.

As ſoon as the battle was over, all the chief officers preſented their *Nezzurs* of congratulation to the SHAH; and his majeſty, having taken a ſlight view of the field of battle, returned to his tent, as all the other commanders did to theirs, leav-

ing

ing the inferior officers and private ſoldiers to continue the plunder and purſuit at their own diſcretion.

Towards morning, ſome of BERKHORDAR KHAN's *Durranies* having found the body of BISWAS ROW, on his elephant, after taking the elephant and jewels, brought the body to SHUJA-UL-DOWLAH, who gave them two thouſand rupees for it, and ordered that it ſhould be taken care of. IBRAHIM KHAN GARDEE, though ſeverely wounded, had been taken alive by SHUJA KOULY KHAN, one of SHUJA-UL-DOWLAH's own people; which being reported to his Excellency, he ordered him to be carefully concealed, and his wounds to be dreſſed.

The SHAH next day ordered SHUJA-UL-DOWLAH to ſend the body of BISWAS ROW for him to look at; which he accordingly did. The whole camp, great and ſmall, were aſſembled round the SHAH's tent to ſee it; and every one was in admiration of the beauty of its appearance: it was not disfigured by death, but looked rather like a perſon who ſleeps: he had one wound with a ſword on the back of his neck, and a ſlight one with an arrow over his left eye, but there was no blood diſcoverable on any part of his remaining clothes. Upon ſight of this body, many of the *Durranies* aſſembled in a tumultuous manner, ſaying, "This is the body of "the king of the unbelievers; we will have it dried and ſtuffed to carry back to "*Kabul*." Accordingly it was carried to the quarter of BERKHORDAR KHAN, and depoſited near the tent of MOOTY LOL, a *Kettery* by caſt, who was his *Dewan*.

As ſoon as SHUJA-UL-DOWLAH heard of this, he waited upon the SHAH, and joined with the Grand *Vizier*, repreſented to his majeſty, "that enmity ſhould be "limited to the life of our enemy; and it is always the cuſtom of *Hindoſtan*, that "after a victory, the bodies of the chiefs, of whatever race or tribe, are given up, "that they may receive their proper obſequies, according to the rules of their par-"ticular religion: ſuch conduct, they ſaid, does honour to the victors, but an op-"poſite one diſgraces them. Your majeſty is only here for a time, but SHUJA-UL-"DOWLAH, and the other *Hindoſtany* chiefs, are the fixed reſidents of this country, "and may have future tranſactions with the *Mahrattas*, when their conduct on the "preſent occaſion will be remembered; therefore let the body be given up to them, "that they may act as is cuſtomary here."

This matter remained in agitation for near two days, NUJEIB-UL-DOWLAH, and indeed all the *Hindoſtany* chiefs, joining in the ſame requeſt. I was alſo ſent on this account, accompanied by MEIG RAJ, the *Vakeel* of NUJEIB-UL-DOWLAH, to the

the tents of BERKOHRDAR KHAN and MOOTY LOL. A ſecond time I went alone, when MOOTY LOL aſked me if I came on that buſineſs only, or would undertake any thing further: I ſaid, "for any thing that he choſe to communicate." Accordingly he carried me privately into two inner tents; in one I found *Raja* BABOO PUNDIT, the BHOW's *Vakeel*, who was wounded, with whom I converſed for ſome time; after which I went into the other tent, where ROW JUNKOOJEE *Sindia* was ſitting; he was wounded with a ball, and with a ſpear in the arm, which he wore in a ſling, and was a youth about twenty years of age. Upon ſeeing me he hung down his head; on obſerving which, I ſaid to him, "Why do you do ſo, Sir? "whatever could be expected from human valour and exertion, you have done; "and the deeds of that day will live for ever in the memory of mankind." Upon this, lifting up his head, he ſaid, "True, no one can contend with deſtiny. I wiſh "I had died in the field of battle; but it was my fate to be brought hither. Theſe "people now require ranſom from me, nor would it be difficult for me to pay what "they demand, but it is impoſſible for me to get it here at this time. You were a "friend of my father's, and there was always friendſhip between my family and the "*Navab*'s, and my father did them conſiderable ſervices: if his Excellency will pay "the money required for my releaſe, it is an obligation that I ſhall never forget." I aſſured him that the *Navab* would not be backward, and deſired to know how much was required. MOOTY LOL ſaid, ſeven lacks of rupees was the ſum mentioned, but that it might probably be ſettled for leſs. I immediately returned to the *Navab*, whom I found ſitting with NUJEIB-UL-DOWLAH; I told him all that had paſſed reſpecting the buſineſs he ſent me upon; but as I well knew the enmity which NUJEIB-UL-DOWLAH bore to the family and perſon of JUNKOOGEE, and thought, that from his good intelligence he might have ſome intimation that JUNKOOGEE was taken alive, I thought it beſt to avoid ſaying any thing about him to the *Navab* at that time, and went away to another part of the tent: but NUJEIB-UL-DOWLAH, who had obſerved me, ſaid to the *Navab*, "From the countenance "of CASI RAJA, I perceive he has ſomething elſe to ſay which my preſence pre- "vents." SHUJA-UL-DOWLAH replied, that there were no ſecrets between them two; and immediately calling me, made me ſwear by the *Ganges*, to ſpeak all that I ſhould have done if NUJEIB-UL-DOWLAH had not been there; which being thus compelled to do, I did. NUJEIB-UL-DOWLAH, who was maſter of the moſt profound diſſimulation, ſaid, that it was highly proper, and becoming great men, to relieve their enemies under ſuch circumſtances; he therefore begged that SHUJA-

UL-DOWLAH

UL-DOWLAH would ſettle the ranſom of JUNKOOJEE, and that he himſelf would pay half of it. This was his profeſſion; and ſoon after taking leave, he went to the Grand *Vizier*, and informed him of all the particulars.

As, on one hand, NUJEIB-UL-DOWLAH wiſhed to exterminate the family of *Sindia*, the Grand *Vizier* alſo was an enemy to BERKHORDAR KHAN, whom he hoped to injure by diſcovering this ſecret negociation: they therefore went immediately together to the SHAH, and laid the affair before him. His Majeſty ſent for BERKHORDAR KHAN, and queſtioned him about having concealed JUNKOOJEE; but he poſitively denied having any knowledge of it. The Grand *Vizier* then ſent for me to prove the fact; but even after that, BERKHORDAR KHAN perſiſted to deny it. Upon which the SHAH ordered his *Neſuckchees* to ſearch the tents of that chief. Thus driven to extremity, BERKHORDAR KHAN immediately diſpatched orders to his people to put both the priſoners to death, and bury them privately, before thoſe ſent by the SHAH ſhould arrive to look for them: which was done accordingly, and thus thoſe unhappy people loſt their lives.

IBRAHIM KHAN GARDEE had hitherto remained in SHUJA-UL-DOWLAH's camp, and it was his Excellency's intention to ſend him privately to *Lucnow*; but ſome of the SHAH's people getting information of this, informed his Majeſty of it, who ſent for his Excellency, and queſtioned him on the ſubject. He at firſt denied it, but at length the SHAH, by dint of perſuaſion and flattery, got him to confeſs it. Immediately (as had been preconcerted) a great number of *Durranies* ſurrounded the SHAH's tent, crying out, "IBRAHIM KHAN is our greateſt enemy, and has "been the deſtroyer of multitudes of our tribe; give him up to us, or let us know "who is his protector, that we may attack him." SHUJA-UL-DOWLAH put his hand upon his ſword, and ſaid, "Here he is:" and things were very near coming to extremity, when the Grand *Vizier* interfered, and taking SHUJA-UL-DOWLAH aſide, he entreated him to conſign IBRAHIM KHAN to his care for one week, promiſing to reſtore him ſafe at the end of that time. The *Navab* expreſſed ſome apprehenſion of intended treachery; but the Grand *Vizier* ſwearing on the *Koran* that no harm ſhould befal the priſoner, SHUJA-UL-DOWLAH ſent for IBRAHIM KHAN, and delivered him into the Grand *Vizier*'s hands.

The SHAH ordered him to be brought into his preſence, and inſultingly aſked him, "how a man of his courage came to be in ſuch a condition?" He anſwered, "that no man could command his deſtiny; that his maſter was killed, and himſelf "wounded and priſoner; but that, if he ſurvived, and his Majeſty would employ "him

"him in his ſervice, he was ready to ſhew the ſame zeal for him as he had done "for the BHOW." The SHAH gave him back in charge to the Grand *Vizier*, where he was treated with the greateſt cruelty; and, as it is ſaid, they ordered poiſon to be applied to his wounds, ſo that he died the ſeventh day after.

The day after the battle, the SHAH, ſuperbly dreſſed, rode round the field of battle, where he found thirty-two heaps of the ſlain of different numbers, moſt of them killed near each other, as they had fought; beſides theſe, the ditch of the BHOW's camp, and the jungles all round the neighbourhood of *Paniput*, were filled with bodies. The SHAH entered the town of *Paniput*, and, after viſiting the ſhrine of BOO ALLY KALINDER, he returned to his tents.

SHUJA-UL-DOWLAH took ſome hundreds of *Biſhties* with him to the field of battle, to waſh the bodies, and look for thoſe of the chiefs, eſpecially for that of the BHOW; and carried the *Mahratta Vakeels* SINADUR PUNDIT, and GUNNEISH PUNDIT, and other priſoners, who knew the perſons of all the chiefs, to aſſiſt him in finding them out. Accordingly they found the bodies of JESWUNT ROW POWAR, and the ſon of PALA JADOO, and many others.

The ſecond day, after the ſtricteſt ſearch had been made for the body of the BHOW, advice was brought that a body was laying about fifteen coſs from the field of battle, which appeared to be that of a chief: SHUJA-UL-DOWLAH immediately went to the place, and had the body waſhed: ſome pearls of the value of three or four hundred rupees each, being found near the body, confirmed the belief of its being that of a perſon of rank. The pearls the *Navab* gave to SINADUR PUNDIT the *Mahratta Vakeel*, who, as well as the reſt of the *Mahrattas* who came to find out the bodies burſt into tears, and declared this to be the body of the BHOW, which they diſcovered by ſeveral natural marks, which the BHOW was known to have about him. Firſt, a black ſpot about the ſize of a rupee on one of his thighs; ſecondly, a ſcar in his back, where he had been wounded with a *Kuttar* by MAZUFFER KHAN; and thirdly, in his foot the fortunate lines, called by the aſtrologers, *Puddum Mutch*. The body was that of a young man about thirty-five years old, and ſtrongly made; and as it was known that the BHOW every day made one thouſand two hundred proſtrations before the ſun, ſo were there the marks of ſuch a practice on the knees and hands of this corpſe.

While we were thus employed, I obſerved one of the *Durranies*, who ſtood at a diſtance and laughed; which I remarked to the *Navab*, and told him, that perhaps that man might know ſomething reſpecting the body. The *Navab* took him aſide,

aſide, and queſtioned him; to which he anſwered, "I ſaw this perſon ſeveral "times during the battle; he was extremely well mounted, and, in the courſe of "the action two of his horſes were killed under him; at laſt he received ſeveral "wounds, and was diſmounted from his third horſe. About this time the *Mahratta* army fled on all ſides, yet this perſon ſeemed ſtill to preſerve his preſence "of mind. He was well dreſſed, and had many jewels on, and he retired with a "ſhort ſpear in his hand, and with a reſolute aſpect. I and ſome others purſued "him for the ſake of his jewels, and, having ſurrounded him, we aſked him if "he was ſome chief, or the BHOW himſelf: and told him not to be afraid, for "we would do him no harm, but carry him wherever he deſired. As he made "no reply one of my companions grew angry, and wounded him with a ſpear, "which he returned; upon which we killed him, and cut off his head, but not "without his wounding two or three of us: the head another perſon has got." This laſt circumſtance was not true, for the head was afterwards found with this very man.

The *Navab* carried the body, and that of SUNTAJEE NAJAH (which had forty cuts of ſwords upon it) to the camp, upon two elephants, and informed the SHAH of all the circumſtances.

The SHAH, in compliment to SHUJA-UL-DOWLAH, gave orders that theſe two bodies, together with the body of BISWAS ROW, ſhould be burnt, according to the cuſtom of their caſts; and ſent twenty of his *Neſuckchees* to attend, and prevent the *Durranies* from giving any interruption to the ceremony. His excellency gave the bodies in charge to me, and told me that I was of the ſame country and tribe, and therefore he deſired that I would burn them with the proper ceremonials; and he ſent *Rajah* ANUFGHIRE with the *Neſuckchees* to attend me. Accordingly I carried them to a ſpot between the SHAH's camp and the *Navab*'s, and, having waſhed them with *Ganges* water, and perfumed them with ſandal wood, I burnt them.

About two thouſand of the fugitives from the BHOW's camp, who had eſcaped from ſlaughter by SHUJA-UL-DOWLAH's protection, were preſent on this occaſion, and all were of opinion that the headleſs body was the BHOW's; but ſtill, the head not having been ſeen, there was ſome room for doubt. In the evening, after burning the bodies, we returned to camp. At night SHUJA-UL-DOWLAH went to the Grand *Vizier*, and told him what the *Durrany* had ſaid reſpecting the head. The *Vizier* ſent for the *Durrany* who belonged to BERKHORDAR KHAN, and told him not to fear being obliged to give up his plunder, that he ſhould keep it all if

he would confeſs where the head was. Upon this the *Durrany* brought it wrapped up in a cloth, and threw it down before the Grand *Vizier*. *Rajah* BABOO PUNDIT, the *Mahratta Vakeel*, being ſent for to look at the head, immediately ſaid, "This is the head of the BHOW: he was my maſter, and the care of this is a ſa-"cred duty to me; let me beg that this head may be given to me, and that I may be "permitted to burn it, according to the ceremonial of our religion." The Grand *Vizier* ſmiled at this requeſt, and gave the head to him, at the ſame time ſending ſome *Neſuckchees* with him for his protection. *Rajah* BABOO PUNDIT carried the head on the outſide of the camp, and burnt it; after which no man doubted that the BHOW was actually killed. And this concludes all that I perſonally know reſpecting this battle and the death of the BHOW.

I afterwards learned from other parts of the country, that MULHAR ROW, AMAJEE GUICKWAR, BETAL SHU DEO, and ſome other chiefs, fled from the battle and eſcaped. One of the BHOW's wives eſcaped on horſeback, and got ſafe to *Deig*, where *Rajah* SURJA MUL received her with great reſpect, gave her money, clothes, and a *palankin*, and ſent her with an eſcort to *Janſy*, whence ſhe got ſafe to the *Decan*.

SHUMSHERE BEHADER got to *Deig*, wounded; SURJA MUL had his wounds taken the greateſt care of, but he died ſoon after; and his tomb is at *Deig*.

The fifth day after the battle, the SHAH returned to *Dehly*, which he reached in four marches. He wiſhed to ſeize on the empire of *Hindoſtan*; but GOD diſapproved of this deſign.

After our return to *Dehly*, SHUJA-UL-DOWLAH ſent all the fugitives from the *Mahratta* camp, who had taken ſhelter with him, under a guard of his own troops, to the boundary of the *Jauts* dominions, where they were ſafe.

Eight days after this, by the pleaſure of GOD, all the *Durranies* mutinied in a body, and inſiſted on the diſcharge of their arrears for the two years paſt, and alſo that they ſhould immediately march back to *Kabul*. This confuſion laſted for ſome days, during which time the *Durranies* quarrelled with SHUJA-UL-DOWLAH's people, and threatened to attack his camp. His Excellency, highly provoked at this, went to the Grand *Vizier*, and aſked him, "if that was the treatment he "was to experience after all the fine promiſes that had been made to him?" The *Vizier* aſſured him, that both the SHAH and himſelf had the higheſt reſpect and attention for his Excellency; but that the *Durranies* were out of all power of controul. "Then (ſaid the *Navab*), I ſee the value of your promiſe;" and got up to depart.

depart. The *Vizier* embraced him, ſaying, " We ſhall meet again;" but his Excellency made no reply.

As ſoon as he returned to his own camp, he conſulted with his friends; and all agreed that it was no longer adviſeable to remain with the SHAH'S army. Accordingly in the afternoon he decamped, and marched fifteen coſs that night; and in this manner, by five forced marches, he got to *Mindy Gaut* on the *Ganges*. He was apprehenſive that the SHAH might be ſo provoked at the abruptneſs of his departure, as to order him to be purſued; but no ſuch ſtep was taken; and the *Navab* croſſed the *Ganges*, and returned with ſafety into his own dominions.

After this, we learned from the news-writers, the SHAH, finding it impoſſible to pacify his army by any other means, was obliged to give up his views in *Hindoſtan* and to return to *Kabul*; having received above forty lacks of rupees from NUJEIB-UL-DOWLAH for the aſſiſtance which he had given him.

Though this narrative is written from memory, and long ſince the events happened, I do not believe that I have omitted any circumſtance of importance; and thoſe who reflect upon theſe tranſactions, will believe that Providence made uſe of AHMED SHAH DURRANY, to humble the unbecoming pride and preſumption of the *Mahrattas*; for in the eyes of GOD pride is criminal.

NOTES.

P. 412. *inviting)* This meaſure of the BHOW'S ſeems to have been merely a political artifice, to diſunite the *Hindoſtany* chiefs, by exciting in ſome of them a hope of a participating in his conqueſts; for the preceding conduct of the BHOW gives little reaſon to believe that, if the *Durranies* and *Rohillas* had been out of the queſtion, he would have allowed the exiſtence of any power in *Hindoſtan* but that of the *Mahrattas*.

P. 416. *children)* This is a compliment very common among eaſtern nations; and, like moſt of their other compliments, means nothing at all.

P. 417. *addreſs)* Of this they are extremely tenacious; and it is a thing ſo very particularly attended to in the eaſt, that thoſe who have occaſion to correſpond with the *Aſiaticks*, cannot be too well acquainted with every one's addreſs; for any deviation excites either diſguſt or ridicule.

P. 420. *Pâgâh)* The word *Pâgâh* has the ſame ſignification among the *Mahrattas* as *Riſâlah* has among the *Perſians* and *Moguls*; and, being indefinite in the number of troops of which it conſiſts, may be rendered pretty fairly by our word *brigade*. I have known it applied to a command of three hundred horſe, and I have alſo known it uſed in the ſame ſenſe to deſcribe one of ſome thouſands of horſe and foot with artillery.

P. 421. *Pindarries)* The *Pindarries* are the freebooters of the *Mahratta* armies, and uſually as numerous as thoſe they account their regulars. They are mounted on ſmall but hardy horſes, and ſerve for plunder only. The chiefs under whom they engage, enter into certain articles of agreement with the chief commanding

commanding the *Mahratta* army, refpecting the divifion of plunder; and the *Pindarries* alfo have particular conditions, on which they ferve under their chiefs. Their principal ufe is in laying wafte an enemy's country, or their own when invaded; which they do with great alacrity and effect: alfo in attacking the baggage and camp-followers of an enemy's army. Another thing, which makes them extremely ufeful to their own army, is, that every *Pindarry* has a pair of large bags on his faddle, which, after his day's excurfion, he in the evening brings into camp, filled with wheat, barley, rice, or fome other ufeful grain, plundered from the villages, which is fold in the bazar for fomething below the market-price; fo that ten thoufand *Pindarries* are at leaft as ufeful to the fupply of their own army as an equal number of *Bunneahs* with carriage-bullocks would be.

P. 421. *The troops)* This feems to have been the crifis of the BHOW's fortune: had he boldly attacked the SHAH while he was paffing the *Jumna*, he would probably have totally defeated him.

Ibid. his camp.) Colonel DOWE fays, that the BHOW occupied the lines formerly thrown up by MAHOMMED SHAH, and that the DURRANY SHAH pofted himfelf in the more fortunate camp of NADIR SHAH. KASSI RAJH does not notice this, but fays that the BHOW dug a trench round his camp. The point however is of little confequence.

P. 429. *January)* Colonel DOWE fays, it was on the 20th, not the 6th of *Jemad-ul-Sani*. The reader may believe either, without any injury to the fact of the battle itfelf. Dates are exceedingly inaccurate in all oriental productions.

P. 430. *duft.)* This may appear extraordinary to thofe who have never feen a large army of horfe galloping about on a dufty plain, in a hot climate, but is a very natural and true defcription to thofe who have.

If I am not miftaken, PLUTARCH mentions, as one of the moft cruel fufferings of CRASSUS's army, when defeated in *Parthia*, that the *Parthians* galloped round them continually, and almoft fuffocated the foldiers with duft.

P. 431. *enmity.)* DATTEA JU PATEIL, the brother of JUNKOOGEE, had been killed the year before, in the battle of *Badelly*, againft NUJEIB-UL-DOWLAH.

Ibid. orders) Thefe orders of AHMED SHAH evince much military knowledge: perhaps better can fcarcely be imagined in the fituation of affairs; and the fuccefs was complete.

P. 432. *enchantment)* The *Mahratta* army fled in confequence of the death of BISWAS ROW, their chief. This is always the cafe with *Afiatick* armies.

Ibid. fouls) This number feems very great, but any perfon acquainted with the multitude of followers in an *Indian* camp, will not difbelieve it. Even in *Englifh* camps in *India*, three followers to each fighting man, is confidered as a moderate number.

Ibid. merit) This is looked upon as highly beneficial to the fouls of the faithful; and almoft a certain paffport to paradife.

P. 434. *Ganges)* This is one of the many inftances among this people, where abfurd fuperftition is brought in excufe of lax morality. What the author adverts to is very common, both among *Hindoos* and *Muffulmans*. It is rather an adjuration than any thing that might reafonably be deemed obligatory (even though its object were innocent) on the perfon on whom it is involuntarily impofed; and is ufually practifed to make men betray fecrets which they are bound in honour to conceal. He who wifhes to difcover the fecret, fays, "I adjure you by the *Ganges*, or the *Koran*, or your fon's head." This the other pretends to confider

consider a sufficient compulsion for him to betray his trust: I say pretends, because where the secret regards their own interest or safety, they are very far from allowing an equal force to the adjuration.

P. 436. *cruelty)* The cause of this extraordinary enmity to IBRAHIM KHAN, was his having fought on the side of the infidels against the true believers.

P. 438. *killed)* Notwithstanding all this, however, in the year 1779, a man appeared, who called himself the BHOW, and from many circumstances obtained credit for some time.

He came first to *Etaiva*, and made himself known to LALA BALGOBIND, a merchant with whom the BHOW had been on terms of friendship. BALGOBIND was so far persuaded of his identity, that he treated and entertained him with great respect: but, though he brought many circumstantial proofs that he was the BHOW, and his age, person, and several marks about his body, strongly supported that belief, still there appeared a difference in temper and manner, which excited doubt. BALGOBIND having expressed his wish to be satisfied respecting this, the person replied, that after the battle and pursuit, from which he escaped alive, though wounded, he fled to the hills of *Kámáoun*, where he lived five years among a fraternity of *Fakeirs*, conforming to all their austerities; which must necessarily have made a great change in his manners. That after this, he had resided some time in *Rohilcund*, and had travelled to many places in the disguise of a *Byraghy fakeir*. "At length," said he, "I am arrived here, and we must devise the best method for me to declare myself." BALGOBIND told him, that, as there were many *Mahrattas* at *Benares* to whom the BHOW was known, he had better first shew himself there. Accordingly he went to *Chutterkote*, in *Bondelcund*, from whence he wrote (as the BHOW) to MORJEE BHUT, RAMCHUND GOTKUR, and GUNNEISH BHUT, at *Benares*; informing them that he was arrived at *Chutterkote*, and desiring them to come to him immediately.

Upon receipt of this letter, MORJEE BHUT, the son of RAMCHUND GOTKUR, and DOONDOO BHUT, who was an old servant of the BHOW, set out for *Chutterkote*, where they immediately waited upon the supposed BHOW, and had a long conference with him; after which they retired to a house in the town. Next day they waited upon him again, when, in the course of the conversation, the supposed BHOW told them, that as he had left many lacks of rupees, as a deposit with them, before the battle of *Paniput*, he desired that they would furnish him with some money, to defray the expence of the rank which he meant to assert. On this they immediately got up, and went away; and from that time they began to circulate a report that this was not the BHOW, but an impostor. When he heard this, he reproached them with ingratitude, and told them that he would come to *Benares*, and establish his claims upon them: they however persisted to deny them, and returned to *Benares*. The supposed BHOW followed them, and arriving at *Benares*, went to reside at the house of DOONDOO BHUT, who all along acknowledged him. Here several *Mahrattas*, and other considerable inhabitants of that town went to see him, and were so far convinced of his identity, that they gave and lent him large sums of money. Several of the *Mahrattas* also ate with him, in proof of their belief of his story. But four or five of the principal merchants, whom he had asserted to be his debtors, would not visit him; at which he was so much provoked, that he sent word to MORJEE BHUT, RAMCHUNDER GOTKUR, and GUNNEISH BHUT, either to pay him what they owed him, by fair means, or that he would compel them by force: at the same time he began to raise some troops in the town, and soon got together some hundreds of the kind of soldiery procurable in every town of *Hindostan*. He also got a palkey, and two or three horses for himself, with which cavalcade he used to come into the town, and pass in terror round the houses of his debtors, who were much alarmed lest he should seize upon them and carry them off.

Mr. THOMAS GRAHAM, who at this time was resident on the part of the company at *Benares*, hearing of

of these proceedings, inquired of several persons of character, whether, in their opinion, this man was the BHOW or not; who all replied that he certainly was an impostor. While this inquiry was going on, it was discovered that DOONDOO BHUT, a confidential friend of the BHOW (as has been said before) was carrying on some secret negociation with RAJA CHEYT SING, who had sent him money at different times. Mr. GRAHAM was led to believe, from many circumstances, that one object of this negociation was to have him destroyed, under cover of some popular insurrection; the *Raja* having at that time conceived a jealousy of him, on account of his knowledge in the affairs of that district, which the *Raja* wished as much as possible to conceal. As the *English* were then at war with the *Mahrattas*, and RAJA CHEYT SING thought to be rather dissatisfied with the government, Mr. GRAHAM was very naturally alarmed at this intelligence, and sent a message to the *Raja*, requesting that he would explain himself. In reply, RAJA CHEYT SING assured him that he was perfectly ignorant of the matter in question, and desired that Mr. GRAHAM would send for the person himself and inquire. Mr. GRAHAM accordingly did send for him, but he peremptorily refused to come, with expressions of contempt for the resident's authority.

Mr. GRAHAM having advised the *Raja* of this, and called upon him for assistance, as the person in whose hands the government of the country was, as to its police, the *Raja* immediately sent the *Ameer* and *Cutwal* of *Benares* with a detachment of Sepoys, to seize upon the supposed BHOW, and confine him. They accordingly surrounded the house in which he resided, and, after some little resistance, they took him prisoner, and carried him to Mr. GRAHAM, who asked him some questions; to which his answers were not satisfactory, and rather tending to confirm the suspicions already conceived of RAJA CHEYT SING.

The supposed BHOW remained a prisoner in the Aumeins Cutcherry at *Benares*, till Mr. GRAHAM having consulted the board at *Calcutta*, received their orders to send him to *Chunarghur*, and deliver him in charge to the commanding officer there; and they at the same time directed him to inquire particularly into the truth or falsehood of his story. This person was accordingly confined at *Chunarghur*, where Mr. GRAHAM went several times, and sent for the prisoner, whom he questioned particularly respecting his whole story; the result of which was, his feeling some disposition to credit his being the BHOW, and occasionally assisting him with money. Soon after, Mr. GRAHAM went to *Calcutta*, carrying with him an agent on the part of the supposed BHOW; but in a short time after, he himself going to *Madras* as secretary to Sir EYRE COOTE, nothing was determined respecting that affair, and the unfortunate man remained a prisoner till *August*, 1781, when Mr. HASTINGS, the Governor General, came to *Benares*, and the troubles with RAJA CHEYT SING commenced. During the time of Mr. HASTINGS's residence at *Chunarghur*, he sent for the prisoner, and, after hearing his story, ordered him to be released. The man returned to *Benares*, where he died soon after.

Among others, KASSI RAJH PUNDIT, the author of this book, being at *Benares*, when the supposed BHOW resided there, went to see him, and said (as BALGOBIND had done) that the person exactly resembled the real BHOW, and that the marks upon him (the same as mentioned in his narrative of the battle of *Paniput)* exactly corresponded, but that the manner and temper were different.

Thus the affair stands at present a subject for unbounded conjectures; and the *Benares* BHOW will generally be classed with LAMBERT SIMNEL, PERKIN WARBECK, the *Russian* DEMETRII, and many others whom ill success has transmitted to posterity as impostors, when better fortune in the precarious appeal to the sword, would perhaps have stamped them the real much-injured heirs of their domains, restored by the hand of Heaven, to bless their subjects by the benign exercise of legitimate authority.

" The vanquish'd rebel like a rebel dies:
" The victor rebel plumes him on a throne."

This

This man had written a hiſtory of himſelf in the *Perſian* language, which he gave to Mr. THOMAS GRAHAM, who would have indulged me with the peruſal of it, but having left it behind him when he went to the coaſt with the late Sir EYRE COOTE, in a place not ſufficiently dry, it was unfortunately deſtroyed by vermin.

P. 438. SHUMSHERE.) This was the father of ALY BEHADER, now at *Muttra* (in 1790) with TOKOJEE HULKER.

Ibid. He wiſhed) This is the only hiſtorical intimation that I remember to have met with of this fact, yet it is extremely probable; and I was told by people of the firſt authority, when I was at *Dehly*, that the connection which AHMED SHAH DURRANY formed with the houſe of TIMUR when he was in *Hindoſtan*, was with that view. He himſelf married a daughter of MOHAMMED SHAH, and gave a young daughter of ALUMGHIRE SANI (conſequently a ſiſter or half-ſiſter of SHAH ALUM) to his ſon TIMUR SHAH, who has ſince ſucceeded him in the throne of *Kabul*, &c. But his conſtant apprehenſions on the ſide of *Perſia*, and a diſpoſition void of enterpriſe, have hitherto prevented TIMUR SHAH from attempting any thing in *Hindoſtan*; and, as he grows older, it is probable that his pacific conduct will ſtill continue.

P. 439. *Navab.)* It cannot fail to ſtrike every reader, that though KASSI RAJH PUNDIT was a ſervant, and evidently a great admirer of SHUJA-UL-DOWLAH, omitting no fair occaſion of praiſing him, yet he ſays nothing of what DOWE and ſome others tell us of SHUJA-UL-DOWLAH's being highly inſtrumental to gaining the victory at *Paniput*, by wheeling round upon the flank of the *Mahrattas*, at a critical part of the battle. On the contrary, by his very clear and minute detail, it appears that SHUJA-UL-DOWLAH's diviſion never moved from their firſt poſt, but thought themſelves fortunate in not being attacked where they were. As, independent of hiſtorical truth and his maſter's credit, KASSI RAJH would himſelf have derived ſome ſhare of reputation from the gallant actions performed by that diviſion, it does not ſeem likely that he would have paſſed ſuch a circumſtance over in ſilence, if it had ever happened.

AN EXPLANATION OF THE PLAN.

A. *Paniput*, with the *Mahratta* Camp.
1 Diviſion of IBRAHIM KHAN.
2 Diviſion of AMAJEE GWICKWAR.
3 Diviſion of SHU DEO PATUL.
4 Diviſion of the BHOW and BISWAS ROW.
5 Diviſion of JESWONT ROW.
6 Diviſion of SHUMSHERE BEHADER.
7 Diviſion of MULHAR ROW.
8 Diviſion of JUNKOOGEE *Sindia*.

B. The *Durrany* Camp.
C. *The* SHAH's *advanced Tent*.
1 Diviſion of BERKHORDAR KHAN.
2 Diviſion of AMIR BEG, &c.
3 Diviſion of DOONDY KHAN.
4 Diviſion of HAFIZ RAHMUT KHAN.
5 Diviſion of AHMED KHAN BUNGUSH.
6 Diviſion of the Grand *Vizier*.
7 Diviſion of SHUJA-UL-DOWLAH.
8 Diviſion of NUJEIB-UL-DOWLAH.
9 Diviſion of SHAH PUSSUND KHAN.
10 *Perſian* Muſketeers.

Remark by the PRESIDENT.

THE preceding narrative brings to my mind an anecdote, which I received from BAHMEN of *Yezd*, whoſe father BAHRA'M had been a confidential ſervant of CARI'M

CARI'M KHA'N, and heard it at *Shiráz* from the lips of the KHA'N himſelf. Both CARI'M *Zend* and AHMED *Abdáli* were officers of NA'DIR *Sháh*; and, having diſpleaſed him at the ſame time, for a little neglect of their duty as commiſſaries, were put under arreſt, and confined for ſome days in the ſame guard-room; but ſuch are the viciſſitudes of life in unſettled countries, that a ſhort time after, NA'DIR was aſſaſſinated by one of his own kinſmen; CARI'M became, at length, ſovereign of all *Irán*, where he reigned near thirty years univerſally beloved; and AHMED, having founded a new kingdom at *Kábul*, obtained the victory at *Pánipat'h*, without which the *Mahráttas* would, perhaps, at this day have been the moſt powerful nation of *India*.

TO COLONEL PEARSE.

DEAR SIR,

THE following is an extract from a paper written in 1782, and intended for a periodical mathematical publication, which I then had the care of: as it moſtly relates to a ſubject of which no perſon is a better judge than yourſelf, if you think it worthy of a place in the *Tranſactions* of the *Aſiatick Society*, I requeſt you will tranſmit it.

I am, dear Sir,
Your moſt obedient and
moſt humble ſervant,
REUBEN BURROW.

Fort William,
June 10, 1787.

VI.

A SPECIMEN OF A METHOD OF REDUCING PRACTICAL TABLES AND CALCULATIONS INTO MORE GENERAL AND COMPENDIOUS FORMS.

THOUGH practices uſual in one ſcience may often be transferred with advantage to another, yet the general claſs of writers are ſo much more intent upon making books than improvements, that it very ſeldom happens to be the caſe: and therefore, though the following hints can have little claim to ingenuity, they are certainly valuable on account of their uſe.

It

It is common in Aſtronomy, when there are two ſeries of quantities, whoſe reſpective terms depend on each other, to find a general expreſſion for an intermediate term, by what is called the method of interpolation: that is applied by NEWTON to *Comets*, and by DE LA CAILLE to *Eclipſes*; and I ſhall here, as a ſpecimen, apply it to ſome few examples in artillery and fortification.

Let g+hx be an expreſſion by which the quantity a is derived from m, and b from n; then if N is any term in the ſeries m, n, the term derived from it, in the ſeries a, b, will be (an-bm) : (n-m)+N (b-a) : (n-m).

In p. 174 of MULLER's Artillery, the length of a battery for two pieces of cannon is forty-feet; and for four pieces, fifty-eight feet: now if N be the number of cannon, a general expreſſion for the length of the battery may be found, by ſubſtituting two for m, and four for n; forty for a, and fifty-eight for b, in the foregoing form, which then becomes 22+9 N; and therefore, for twenty pieces of cannon, the length of the battery is 202 feet.

By a ſimilar ſubſtitution, if fifty men are required to make the battery for two pieces, and ſeventy for that of four pieces, as in MULLER's Table; then 30+10 N, is the expreſſion for the men required for any number N of pieces in general.

Inſtead, therefore, of MULLER's Table, the following general one may be inſerted for the number of men, tools, &c. for making a battery for any number of cannon in one night.

Number of Pieces.	*Length of the Battery*	*Men to make the*		*Tools.*	*Faſcines in feet.*			*Pickets.*	*Mallets*	*Hand Bills.*	*Platforms.*			*Bavins.*
		Battery	*Faſcines.*		10	8	6				*Planks.*	*Sleepers*	*Pickets.*	
N	22+9N	30+10N	5+5N	40+15N	20+25N	20+14N	8N	180+205N	2+4N	8+2N	18N	5N	32N	25N

In the ſame manner, from having a few particular caſes in other kinds of rules, general ones may be found; for example, if N be a number whoſe r root is required; and if x^r be its neareſt complete power, then we know already, that

$x : N \backsim x :: x : N^{\frac{1}{1}} \backsim x$ for the one root.

$\frac{1}{2}x^2+\frac{1}{2}N : N \backsim x^2 :: x : N^{\frac{1}{2}} \backsim x$ for the ſquare root.

$2x^3+N : N \backsim x^3 :: x : N^{\frac{1}{3}} \backsim x$ for the cube root.

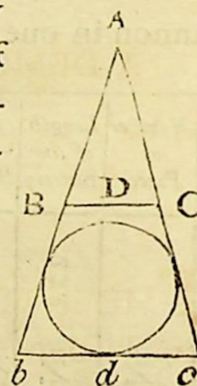
Now

Now the general form of the three laſt terms is evident; and to find thoſe of the firſt term, let one and two be put for m and n; and one and three halves for a and b; and by *ſubſtituting* in the foregoing expreſſion, the general coefficient of x^r is found *to* be $(r+1)$; again if we put o and one half for a and b, we find the coefficient *of* N to be $(r-1)$.

If we uſe the ſecond and third proportions, putting two and three for m and n, and for a and b, three halves and two, in the firſt caſe; and one-half and one, in the ſecond we get the ſame values. Hence in general; $\frac{r+1r}{2}x + \frac{r-1}{2}N : N \backsim x^r :: x : N^{\frac{1}{r}} \backsim x$.

Another example of the advantage of transferring practices from one ſubject to another is this. Dr. HALLEY has applied a method ſimilar to that of interpolation to find the time of *the tropicks*: now the ſun's meridian altitude may be found in the ſame way, from altitudes taken near the meridian, and if the obſerver begins a *little* before noon to take altitudes and the times, and continues to do ſo till a little after noon, a number of meridian altitudes may be deduced from theſe, and the latitude found much more exactly from them, than can be expected from a ſingle meridian altitude, by uſing the expreſſion for the maximum, or otherwiſe.

Analogous to theſe, are methods of generalizing properties from particular caſes: thus, if Ab Ac be tangents to a circle, and if any lines BC bc, be alſo drawn to touch the circle; then the perimeters of all the triangles A B C, will be conſtant, and alſo the difference between the ſum of Ab and Ac and the baſe bc: this property is of uncommon uſe in the conſtruction of *problems, relative to plain* triangles and trapeziums; and *if lines* be ſuppoſed drawn from the centre, or a point in *the circumference* of a ſphere, to each part of the figure, *it will be found*, that the projection of the figure upon the ſphere *will* have analogous properties, and that the theorem is alſo true in ſpherical triangles. By a little mode of conſideration, problems ſimilar to thoſe of APOLLONIUS on tangencies may be conſtructed on the ſphere: for inſtance, having three circles given upon a ſphere, a fourth may be found to touch them; for their poſitions on the ſphere being given, their projections will alſo be given on a plane ſtereographically; and as a circle may be found in VIETA's method to touch them on that plane, the ſituation of that circle may be found upon the ſphere, and hence properties may be found for conſtructing the



the problem independent of the ſtereographic projection: and if we ſuppoſe the centre of projection to be the centre of focus, &c. of a ſpheroid or other ſolid, innumerable properties may be found relative to their tangents, curvatures, &c. regard being had to the poſition of the plane, &c.

To give a ſpecimen of the aforeſaid method in fortification, let h (ſee pp. 22, 23, 24, and 25, of DEIDIER's *Perfect French Engineer*) repreſent the height of a wall; then, according to VAUBAN's meaſures, if five feet be the thickneſs at the top, $\frac{1}{5}h+5$ will be the thickneſs at the bottom; and, according to BELIDOR's method $\frac{1}{10}h+3,5$ will be the thickneſs at the top, and $\frac{1}{3}h+3,5$ that at the bottom. The length of the counterfort (according to VAUBAN) will be $\frac{1}{5}h+2$; alſo $\frac{1}{10}h+2$ is the thickneſs next the wall, and ($\frac{1}{15}h+4$) the thickneſs at the other end of the counterfort. If part of the wall is gazoned, let e be the height of that part and h that of the wall; then $\frac{1}{5}(h+e)+5$ is the thickneſs at the bottom; $\frac{1}{5}e+5$, is the thickneſs at the top; $\frac{1}{5}(h+e)+2$ is the length of the counterfort; $\frac{1}{10}(h+e)+2$, its thickneſs next the wall, and $\frac{1}{7}(\frac{1}{3}(h+e)+4$ its thickneſs fartheſt from the wall. When there are cavaliers, let c be their height in feet; then $\frac{1}{10}(2e+c+50)$ is the thickneſs of the revêtement at the top, and $\frac{1}{10}(2h+2e+c+50)$ is the thickneſs at the bottom.

A DEMONSTRATION OF ONE OF THE HINDOO RULES OF ARITHMETICK.

By Mr. REUBEN BURROW.

THE art of invention being in a great meaſure dependent on the doctrine of combinations; every additional improvement in the laſt muſt of conſequence be uſeful in the former; and as the following ancient rule for "*finding the ſum of all* "*the different permutations of a given numeral quantity, conſiſting of a given number* "*of places of figures,*" is not, I believe, extant in any *European* Author, and is beſides very ingenious; I take the liberty to inſert it, and alſo to add the demonſtration.

Rule. Place an Arithmetical progreſſion over the figures, beginning with unity at the unit's place, and increaſing by unity; divide the product of the terms of this progreſſion by the number of places of figures in the given quantity: multiply the ſum

ſum of the figures in the given quantity by the quotient, and ſet down the product as often as there are places in the given quantity; removing it each repetition one place to the right hand, and the ſum of theſe lines is the ſum of all the permutations.

Example. Required the ſum of the different permutations of 893.

$$\frac{1\times2\times3}{3}=2;\ (8+9+3)2=40;$$

3	2	1	40	893
8	9	3	40	839
			40	983
			——	938
			4440	389
				398
				——
				4440

DEMONSTRATION.

Firſt, it is evident that if all the permutations of any number of letters expreſſing figures be put down; and thoſe in the firſt place to the right hand be multiplied by unity; thoſe in the ſecond place by ten; thoſe in the third place by 100, and ſo on; then the ſum of all theſe will be the ſum of the permutations required.

Secondly, Suppoſing the different permutations to be put down one under another, it will really appear, from the manner in which permutations are generated, that all the letters occur an equal number of times in each perpendicular column; and alſo that the number of times of occurrence in the permutations of n letters, is equal to the permutations of n—1 letters; but the permutations of n—1 letters is equal to 1.2.3...(n—1) or 1×2×3 carried to n—1 terms; and conſequently if there be n letters in the given number, each letter in the columns aforeſaid will occur 1.2.3... (n—1 times).

Thirdly, Let 1.2..(n—1)=m then,

m (a+b+c+..n) 1= ſum of numbers in the unit's place or firſt column.

m (a+b+c+..n) 10= ſum of numbers in the tens or ſecond column.

m (a+b+c+..n) 100=ditto third column.

m (a+b+c+..n) 100... to (n—1) Cyphers=ditto in the n column; and the ſum of theſe is evidently equal to

m (a+b+c+....n).(1+10+100+... to n terms); and putting for (1+10+100..n) its value 111...n, the expreſſion becomes

(1.2.

$(1.2.3..(n-1))+(a+b+c+..n)+(111...n)$; but $1.2.3...(n-1)$ is equal to $\frac{1.2.3...n}{n}$ and therefore the expreſſion for the ſum of all the permutations is $(\frac{1.2.3...n}{n}) \times (a+b+c+...n) \times (111...n)$, which is the Hindoo rule when the figures of the given number are all unlike.

Laſtly, It is evident that $1.2.3...n$ is the number of permutations of n different things; but if ſeveral ſets of figures are alike, as r figures of one kind, s figures of another, for inſtance; then let

$(1.2.3...n):(1.2..r) \times (1.2...s)$, &c. the number of permutations in that caſe be called N; then the ſum of the permutations is

$N:n \times (a+b+c+...n) \times (111...n)$ in general.

Example. Required the ſum of the permutations of 11335?

$\frac{1.2.3.4.5}{1.2.1.2}=30$; $\frac{30}{5}=6$; $6 \times 13=78$;

```
78
 78
  78
   78
    78
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866658 the Sum required.
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VII.

ON THE NICOBAR ISLES AND THE FRUIT OF THE MELLORI.

By NICOLAS FONTANA, *Eſq.*

THE ſouth-weſt monſoon having ſtrongly ſet in on the *Malabar* coaſt, it was deemed unſafe to remain there any longer: we therefore took our departure from *Mangalore* on the 20th of *May*, 1778, directing our courſe towards the gulph of *Bengal*; and in leſs than ten days, we came in ſight of the *Carnicobar* iſlands; the appearance of which, at ſeven or eight leagues diſtance, is much like a chain of mountains covered with woods: we anchored to the N. E. of one of them, in five fathoms

fathoms with a good ſandy bottom; ſupplied ourſelves with water and wood, and proceeded in queſt of the other *Nicobars* or *Nancaveris*, as they are called, ſituated between eight and nine degs. N. lat. to the northernmoſt point of the iſland of *Sumatra*. They were deſcried on the 4th of *June*, to the S. W. ½ W. at the diſtance of ten leagues: the poſition of three of thoſe iſlands forms one of the ſafeſt harbours in *India*, where ſhips of all ſizes may ride with the greateſt ſecurity, ſheltered from all winds, about half a mile from ſhore; with the additional advantage of two entrances, that may ſerve for getting in and out, both with a N. E. and S. W. monſoon, having a clear deep channel on each ſide.

In one of the bays formed within thoſe iſlands, we moored in twelve fathoms, and there remained until the S. W. monſoon was quite over, which was in the beginning of *September*. The largeſt of thoſe iſlands is called *Nancaveri* or *Nancowry*, about five or ſix leagues in circumference; and better inhabited than any of the other two. The ſecond is called *Soury* or *Chowry*, and the other *Tricút*, all cloſely ſituated: about ten leagues to the N. E. of them is another called *Catchoul**.

Almoſt the whole of thoſe iſlands is uncultivated, though there are a number of large valleys that might be rendered very fruitful, with little trouble, the ſoil being naturally fertile, where the cocoa-nut, and all other tropical fruits, come ſpontaneouſly to the higheſt perfection, together with yams and ſweet potatoes, to obtain which it is only neceſſary to ſcratch the earth ſuperficially, and the ſeeds ſo planted come forth in a few days†.

The ſurrounding ſea abounds with exquiſite fiſh, ſhell-fiſh, as cockles and turtles; and a moſt ſplendid diſplay of beautiful ſhells of the rareſt ſort are to be met with on the ſhore. The birds' neſts ‡, ſo much eſteemed in *China*, are alſo to be found among the rocks: ambergris is likewiſe to be met with, but the inhabitants have learned a mode of adulterating it, and it is therefore ſeldom to be found in a

* In the year 1756, the *Daniſh* E. I. Company erected on one of theſe iſlands a houſe to ſerve as a factory, but on their failure, in the year 1758, it was evacuated. On the re-eſtabliſhment of the Company in 1768, another houſe was built on *Scury* Iſland, which was, in 1773, in like manner, ordered to be evacuated as uſeleſs to the Company's intereſts: three or four *European* miſſionaries, with a view of making proſelytes, remained behind, and have continued there ever ſince, but without effecting even the converſion of a ſingle perſon: they collect, however, cocoanut oil, ſhells, and other natural curioſities, which they ſend annually to their brethren at *Tranquebar*.
An exact plan of thoſe iſlands may be ſeen in the *Neptune Oriental*.

† *Tricut*, being the flatteſt of thoſe Iſlands, is divided amongſt the inhabitants of the other two, where they have their plantations of Cocoanut and *Areca* trees; theſe laſt being very abundant all over the iſlands.

‡ *Nidos hos, rupibus oceani orientalis affixos, parant hirundines marini, domeſticis multo majores, ex holothuriis mari innatantibus materiam decerpentis.* KOEMPF. *Amœn.*—p. 833.

genuine

genuine ſtate: if adulterated with any heterogeneous matter, ſuch as wax, or reſin, the mode of diſcovery is ſimply by placing a ſmall bit of it upon the point of a knife when hot, and if it evaporates without leaving any calx or *Caput Mortuum*, and diffuſes a ſtrong fragrant ſmell, it is certainly genuine.

The inhabitants of the *Nicobar* iſlands are of a copper colour with ſmall eyes obliquely cut, what in ours is white being in theirs yellowiſh; with ſmall flat noſes, large mouths, thick lips, and black teeth; well proportioned in their bodies, rather ſhort than tall, and with large ears, in the lobes of which are holes, into which a man's thumb might be introduced with eaſe: they have black ſtrong hair, cut round; the men have little or no beard; the hinder part of their head is much flatter and compreſſed than ours; they never cut their nails, but they ſhave their eye-brows*. A long narrow cloth, made of the bark of a tree, round their waiſt and between their thighs, with one extremity hanging down behind†, is all their dreſs. The women and men are of the ſame copper colour, and very ſmall in ſtature; a bit of cloth made with the threads of the bark of the cocoa nut tree faſtened to the middle and reaching half way down the thigh, forms all the covering of the women. Both ſexes are, however, very fond of dreſs; and when the men go into the preſence of ſtrangers, they put on hats and old clothes, that had been given them by *Europeans*; but among themſelves they are almoſt naked.

They live in huts, made of cocoa-nut leaves of an oval form, ſupported on bamboos, about five or ſix feet high from the ground; the entrance into the huts is by a ladder; the floor is made partly of planks, and partly of ſplit bamboos. Oppoſite to the door, in the furthermoſt part of the hut, they light their fire and cook their victuals; ſix or eight people generally occupy one hut, and a number of ſkulls of wild boars forms the moſt valuable article of furniture.

* It is a cuſtom among them to compreſs with their hands the occiput of the new-born child, in order to render it flat; as, according to their ideas, this kind of ſhape conſtitutes a mark of beauty, and is univerſally eſteemed ſuch by them: by this method, alſo, they ſay that the hair remains cloſe to the head, as nature intended it, and the upper fore teeth very prominent out of the mouth.

† A traveller called KEOPING, a *Swede*, who went to the *Eaſt Indies*, on board a *Dutch* ſhip in the year 1647, which anchored off the *Nicobar* Iſlands, relates that they diſcovered men with tails, like thoſe of cats, and which they moved in the ſame manner. That having ſent a boat on ſhore with five men, who did not return at night, as expected, the day following a larger boat was ſent, well manned, in queſt of their companions, who, it was ſuppoſed, had been devoured by the ſavages, their bones having been found ſtrewed on the ſhore, the boat taken to pieces, and the iron of it carried away.

The account of this voyage was reprinted at *Stockholm* by SILVIUM in the year 1743—LINNÆUS ſeems to have been too credulous, in believing this man's ſtory, for in all my examinations, I could diſcover no ſort of projection whatever on the *os Cocygis* of either ſex. What has given riſe to this ſuppoſed tail, may have been the ſtripe of cloth hanging down from their poſteriors; which when viewed at a diſtance, might probably have been miſtaken for a tail.

The

The occupation of the men confifts in building and repairing their huts, which affords them an annual employment for fix months at leaft, and in fifhing and trading to the neighbouring iflands. The women are employed in preparing the victuals and cultivating the ground, they alfo paddle in the canoes, when the men go out. They unite in matrimony through choice; and, if the man is not fatisfied with the conduct of the woman, either from her inattention to domeftic concerns, or fterility, or even from any diflike on his part, he is at liberty to difcharge her, and each unites with a different perfon, as if no fuch connection had taken place. Adultery is accounted highly ignominious and difgraceful; particularly with perfons not of the fame caft: fhould it be proved, the woman would not only be difmiffed with infamy, but, on fome occafions, even put to death; although by the intervention of a fmall token given publickly, and confifting of nothing more than a leaf of tobacco, the reciprocal *lending of their wives of the fame caft* is exceedingly common.

A woman who bears three children, is reckoned very fruitful; few bear more than four; the caufe may be attributed to the men, from a debility occafioned by the early intrufion of the tefticles into the abdomen, the hard compreffion of them and the penis, by the bandage round thofe parts, from premature venery, and hebetation brought on by the immoderate ufe of fpirits; and from the very inactive and fedentary life thofe people lead, it will not be difficult to account for that want of longevity, which feems to prevail much in thofe iflands, more efpecially amongft the men, where none were to be feen older than forty or forty-eight years. The women, on the contrary, feem to live much longer.

They are themfelves fo fenfible of the fcanty population of their iflands, that they ftudy to increafe it by inviting, and even feducing, fome *Malabars* or *Bengalefe* to remain amongft them, when brought thither by the country fhips, and of whom there are in almoft all villages fome to be found, who may be eafily difcerned from the natives by their figure, features, colour, and language. The natives encourage their ftay by grants of land with plantations of cocoatrees and arecas, and, after a certain number of years, they are permitted to make choice of a female companion.

Their indolence is not to be equalled by any other people of the eaft. They go out a-fifhing in their canoes at night; and with harpoons, which they dart very dexteroufly at the fifh, after having allured them into fhallow water with burning ftraw, a fufficient number is foon caught to ferve the family for a meal: they immediately

mediately return home; and if, by chance, they catch a very large fish, they will readily dispose of one half, and keep the remainder for their own use.

They entertain the highest opinion of such as are able to read and write: they believe, that all *Europeans*, by this qualification only, are able to perform acts more than human, that the power of divination, controlling the winds and storms, and directing the appearance of the planets, is entirely at our command.

This people, like other savage nations, dread the evil genius; some among them give themselves the air of divination, and presume to have secret confabulations with him: superstition must ever be in its full dominion, where ignorance is so gross.

Some of the natives, having begun to fabricate earthen pots, soon after died; and the cause being attributed to this employment, it has never been resumed; since they prefer going fifteen or twenty leagues to provide them, rather than expose themselves to an undertaking attended, in their opinion, with such dangerous consequences.

Whenever they visit one another, no sort of compliment or salutation takes place between them; but when the visitors take leave, they are profuse in good wishes, that last for some minutes, with different inflections of voice, to which the other constantly answers, by repeating the words *Callá callá condì condì quiagé*, which may be rendered in *English* thus: "Very well, very well, go, go and return soon."

Behind, or close by, their huts the dead are buried; all the relations and acquaintance cry for some hours before the corpse is put into the grave, where it is interred with all possible solemnity, and in the best dress they can muster, and with abundance of food. After the body is covered with earth, a post is raised and fixed in the ground over the head of the deceased, about four feet high, to the top of which they suspend strips of cloth with meal and areca nuts, and strew cocoa-nuts all around. This supply of food for the deceased is even after continued; a cocoa tree is also cut down for every person that dies. As soon as a man is dead, his name is never mentioned, even if repeatedly asked: every one of the mourning visitors brings a large pot of toddy. The women sit round the corpse howling and crying, and by turns they go and put their hands on the breast and belly of the deceased, who is covered with striped cloth: the men are seated at a little distance, drinking, and inviting all the visitors to do the same; endeavouring thus to dispel their grief, by a complete general intoxication, which never lasts less than a couple of days after the interment.

The different changes of the moon are productive of great feſtivity and mirth among the *Nicobarians*, when the doors of their huts are decorated with branches of palms and other trees: the inſide is alſo adorned with feſtoons made of ſlips of plantain leaves. Their bodies are, in like manner, decorated with the ſame ornaments; and the day is ſpent in ſinging, and dancing, and eating, and drinking toddy, till they are quite ſtupiſied.

The idea of years, and months, and days, is unknown to them, as they reckon by moons only, of which they number fourteen, ſeven to each monſoon. At the fair ſeaſon, or the beginning of the N. E. monſoon, they ſail in large canoes to the *Car Nicobars*, called by them *Champaloon*. The object of this voyage is trade; and for cloth, ſilver coin, iron, tobacco, and ſome other articles, which they obtain from *Europeans*, together with fowls, hogs, cocoa, and areca nuts, the produce of their own iſland, they receive in exchange, canoes, ſpears, ambergris, birds' neſts, tortoiſe-ſhell, and ſo forth.

Ten or twelve huts form a village. The number of inhabitants on any one of theſe iſlands does not exceed ſeven or eight hundred. Every village has its *Head Man*, or *Captain*, as they term him, who is generally the oldeſt. Few diſeaſes are known amongſt them; and the venereal not at all: the ſmall-pox viſits them occaſionally, but not of the confluent kind: what is more prevalent amongſt them, is the œdematous ſwelling of one or both of the legs, known in the weſt of *India* under the name of the *Cochin Leg*, from the place where this diſorder generally prevails. This endemial diſeaſe may be imputed to the following cauſes; ill choſen and badly prepared diet; the bad choice of habitations; and an extremely indolent, inactive life. Fevers and cholicks are alſo frequent among them: when a perſon falls ſick, he is immediately removed to the houſe of one of their prieſts, or conjurers, who orders the patient to be laid in a ſupine poſture for ſome time; then friction with ſome oily ſubſtance is applied to the upper part of the body, and often repeated; which remedy they indiſcriminately uſe for all complaints, never adminiſtering medicines internally.

The only quadrupeds on theſe iſlands are hogs and dogs: of the former, however, only the ſows are kept, and they are fed princi ally with the milk of the cocoa-nut and its kernel, which renders the meat of a firmneſs and delicious taſte, even ſuperiour, both in colour and flavour, to the beſt *Engliſh* veal. It may be worthy remark, that, although the neighbouring *Car Nicobar* woods abound with monkeys of different ſpecies, none are to be ſeen in theſe iſlands, notwithſtanding their

their having been repeatedly brought over: they neither propagate, nor do they live for any time.

Among the feathered tribe wild pigeons are pretty abundant from *June* to *September*, on account of a berry which is then ripe, and on which they feed with great eagerneſs: at the ſame time pheaſants and turtle doves are frequently found. The conſtant inhabitants of the woods are a ſpecies of the green parrot, or parroquet, with a black bill and collar: no other birds are to be found in them.

The climate is pure, and might, with little trouble, be rendered very ſalubrious: conſtant ſea breezes fan their ſhores, thus preſerving them from oppreſſive heat: vegetation continues without intermiſſion, the woods are very thick, and the trees bound together by a kind of twig or creeping ſhrub, that renders them almoſt impervious.

The *Nicobar* dance is as dull and inanimate as can be conceived, as well for the ſlowneſs and heavineſs of its motions, as for the plaintive monotonous tune that accompanies it; with no inſtrument but their mournful low voices, which are in perfect uniſon with the motion of their bodies. Men and women form a circle, by putting their hand on each other's ſhoulders; they move ſlowly, backwards and forwards, inclining ſometimes to the right, and ſometimes to the left.

The whole of their muſick conſiſts of the few following notes.

Da Capo

The baſis of the language ſpoken by theſe iſlanders is chiefly *Malay*, with ſome words borrowed from *Europeans*, and other ſtrangers, as will appear by the following ſpecimen:

Chia	Father	*Chegnoun*	Child
Gioum	Grandfather	*Choi*	Head
Chia Enchāna	Mother	*Lal*	Forehead
Ochiá	Uncle	*Moha*	Noſe
Encognee	Man	*Holmat*	Eyes
Covon	Son	*Manonge*	Lips
Encáná	Woman	*Caleta*	Tongue
Cance	Wife	*Incaougn*	Chin

Nann

Nann	Ears
Enchojon	Hairs
Halikolala	Neck
Thà	Breaſt
Vhian	Belly
Foún	Navel
Choal	Arm
Eckait	Shoulders
Och	Back
Kinitay	Hand and fingers
Poto	Thigh
Colcanon	Knee
Hanhan	Leg
Ciſcoa	Nail
Hignoughn	Beard
Tohon	Sick
Lha-ha	Dead
Hivi	Devil
Hen	Sun
Chae	Moon
Háyi	Wind
Onijo	Water
Gnam	Calm
Tenfagi	Day-light
Sciafin	Evening
Hatahom	Night
Kamhen	Noon
Menzovi	Yeſterday
Holactas	To-morrow
Charou	Great
Mombèſchi	Small
Koan	Strong
At'loan	Weak
Jo	Yes
At chiou	No
Lapoa	Is good
Piſi	Is enough
Thiou	Me or I
Mbihe	You
Kalakala younde	Farewel
Emloum	Gold
Henoe	Fire
Dheah	Water
Lhoe	Cloth
Lanoa	A ſtrip they wear
Gni	Houſe
Tanop	Pipe
Carrovaj	Lemon
Hoat	Old Cocoa-nut
Gninoo	Green Cocoa-nut
Nat	Cane
Pantan	Rattan
Aptejo	Cheſt
Cerum	Needle
Hendel	Muſket
Henathoa	Knife
Danon	Medicine
Heja	Betel nut
Achæ	Betel leaf
Cion	Lime
Chapeo	Hat
Lenzo	Handkerchief

*** Theſe two laſt words are borrowed from the *Portugueſe*

Hanchan Chapeo	Put on your hat
Not	A hog
Ham	A dog
Cochin	A cat
Taffoach	Hen

Ohia

Ohia	Egg	*Poushili*	To set down
Inlegne	Birds nest	*Hahahon*	To vomit
Cattoch	Parrot	*Achicienga*	To stand
Cha	Fish	*Hichiackeri*	To speak
Cap	Tortoiseshell	*Athe het*	To write
Hanino	To eat	*Ajouhy*	To light
Peoum	To drink	*Luva*	Lead
Etaja	To sleep	*Carán*	Iron
Ha-caou	To buy	*Chánlo*	Shirt and coat
Hen vhej	To sell	*Hănhă*	Breeches
Laam	To lay down	*Hanho lola*	Stockings
Hancihatena	Come hither	*Dhanapola*	Shoes
Ciou	Be gone	*Halhat*	Bracelet
Hethaj	To laugh	*Henpòjou*	Chair
Houm	To weep	*Cheráchà*	Table
Hanan	To dance	*Pará*	Dollar, or silver
Hame	To rain	*Thanula*	Black
Pheumhoj	To smoke	*Chunla*	Red
Hansciounga	To walk	*Unat*	White
Duonde	To paddle or row	*Cambalamagn*	Striped cloth

NUMERALS.

Heàn	One	*Eancata*	Nine
Haà	Two	*Sicom*	Ten
Loe	Three	*Sicom hean*	Eleven
Toan	Four	*Sicom háa*	Twelve
Tanèe	Five	*Hemon thouma*	Twenty
Tafoul	Six	*Rocate*	Thirty
Isat	Seven	*Toanmoan thiuma*	Forty
Ensoan	Eight	*Sicom sicom*	Hundred

It seems that they have no expression for the numbers beyond forty, except by multiplication.

Trees of great height and size are to be seen in their woods of a compact texture,

ture, well calculated for naval conſtructions*: but the productions of which they are more particularly careful, are the cocoa and *areca* trees, the laſt being chiefly for their own conſumption; as they chew it all day long with tobacco, betel-leaf, and ſhell-lime: the former is not only uſeful for their own and their hogs' nouriſhment, but alſo an object of trade. Moſt of the country ſhips that are bound to *Pegu*, from either of the coaſts of *India*, touch at the *Nicobar* Iſlands, in order to procure a cargo of cocoa-nuts, which they purchace at the rate of four for a tobacco-leaf, and one hundred for a yard of blue cloth, and a bottle of cocoa-nut oil for four leaves of tobacco. The tropical fruits grow in thoſe iſlands exquiſitely flavoured, the pine-apple in particular: wild cinnamon and ſaſſafras grow there alſo; the coffee-tree in two years yields fruit; yams are to be found for three or four months in the year only, and are eaten by the natives inſtead of the *Larum*, a nutritive fruit; in the deſcription of which, and the tree that produces it, we ſhall here endeavour to be very particular.

The tree, that bears this nutritive fruit, is a ſpecies of *Palm*, called by them *Larum*, by the *Portugueſe Mellòri*; and is very abundant in thoſe iſlands, as well as in *Carnicobar:* it grows promiſcuouſly in the woods among other trees, but it delights more particularly in a damp ſoil. The trunk is often ſtraight, thirty or thirty-five feet high, and ten or twelve inches (the oldeſt even two feet) in circumference: the bark is ſmooth, aſh-coloured, with equidiſtant interſections, of a compact hard texture in its interior part, but ſoft and quite hollow in the centre from the top of the trunk; the leaves grow diſpoſed like a calyx about three feet long and four inches broad, enſiform and aculeate, of a dark green hue, and of a tenacious hard ſubſtance: the roots are out of the ground, and inſerted at eight or ten feet on the trunk, according to its age, being not quite two feet in the earth: the fruit, which has the ſhape of a pine, and the ſize of a large *Jaca*, comes out of the bottom of the leaves: the age of a man is ſeldom ſufficient to ſee the trees bearing fruit: its weight forces it out of the leaves, and, when it is nearly ripe, which is known by the natives on the change of its colour from green to yellowiſh, it is gathered, and weighs from thirty to forty pounds. The drupes are looſened by thruſting a piece of iron between their interſtices: the exterior ſurface is cut off, and thus put into earthen pots covered with leaves, then boiled on a ſlow fire for ſeveral hours together: the fruit is ſufficiently boiled, when the medullary part of

* One of theſe trees our people cut down, that meaſured nine fathoms in circumference, or fifty-four feet.

it

it becomes ſoft and friable; it is then taken from the fire and expoſed to the cold air: when cold, the drupes are ſeparated from the ſtalk, and the medullary part preſſed out by means of a ſhell forced into them. Within the woody part of the drupes, there are two ſeeds, in ſhape and taſte much like almonds: the ſoft part is then collected into a ſpherical maſs, and, in order to extract all the ſtringy fragments remaining in it by the compreſſion of the ſhell, a thread is paſſed and repaſſed, until the whole is extracted, and it comes out perfectly clean: it is then of a pale yellow colour, much reſembling *polenta*. or the dreſſed meal of the *Zea Mays*, and in taſte much like it: when not newly prepared, it has an acidity, to which it tends very ſtrongly, if long expoſed to the atmoſphere; but it may be preſerved a long time, if well covered.

It is certain, that the *Nicobar* bread-fruit tree differs very eſſentially from the palm deſcribed by Mr. MASSON, and found in the interior parts of *Africa*, which bears a ſort of bread-fruit. On my ſhowing to Mr. MASSON, in *March*, 1790, the drawing of the tree here deſcribed, he was pleaſingly ſurprized at the novelty, and declared he had never before ſeen it. It differs alſo from the bread-tree found in *Otaheite*, and deſcribed by Captain COOK in his Voyage round the World, as will appear very evident on a reference to the notes of that work. Some ſhrubs, whoſe leaves reſemble much thoſe of the *Nicobar* bread-fruit tree, are to be ſeen on the *Coromandel* Coaſt, and in the iſle of France, where they thrive in ſome degree, but never attain the height of thoſe at *Nicobar:* imperfect ſmall fruits are ſeen once a year ſprouting out, and the inhabitants derive an advantage from the leaves of the tree, which they convert into mats and bags to hold coffee.

[For Note and Plate—*See the Works of Sir William Jones*, *Vol. II. p.* 37.]

NOTE on Page 450.

Though little can be added to M. POIVRE's deſcription of the *Salangane*, or *Hirundo, nidis edulibus*, yet, as Captain FORREST was a perfect maſter of the *Malay* tongue, and deſcribed only what he had ſeen, it will not be amiſs to ſubjoin his account of that ſingular bird. "The bird with an edible neſt is called, ſays he, *Jai-*
"*maláni* by the natives of the *Moluccas*, and *Layang-layang* by the *Malays:* it is
"black as jet, and very much like a marten, but conſiderably ſmaller. Its neſts,
"which the *Malays* call *Sarang*, are found in caves, and generally in thoſe to which
"the

" the ſea has acceſs: and, as they are built in rows on perpendicular rocks, from " which the young birds frequently fall, thoſe caves are frequented by fiſh, and " often by ſnakes, who are hunting for prey: they are made of a ſlimy gelatinous " ſubſtance found on the ſhore, of the ſea-weed called *agal agal*, and of a ſoft " greeniſh ſizy matter often ſeen on rocks in the ſhade when the water oozes from " above. Before a man enters ſuch a cave, he ſhould frighten out the birds, or " keep his face covered. The *Jaimaláni* lays her eggs four times a year, but only " two at a time: if her neſt be not torn from the rock, ſhe will uſe it once more, " but it then becomes dirty and black: a neſt, uſed but once before it is gathered, " muſt be dried in the ſhade, ſince it eaſily abſorbs moiſture, and, if expoſed to the " ſun, becomes red. Such edible neſts are ſometimes found in caves, which the ſea " never enters, but they are always of a dark hue, inſtead of being, like that now " produced, very nearly pellucid: they may be met with in rocky iſlands over the " whole eaſtern Archipelago (by far the largeſt in the world), but never, I believe, " on the coaſt of China, whither multitudes of them are carried from *Batavia.* " The white and tranſparent neſts are highly eſteemed, and ſold at *Batavia* for ſeven, " eight, nine, or ten dollars a catty of $1\frac{1}{3}$lb. but the crafty *Chineſe* at that port, who " pack up the neſts, one in another to the length of a foot or eighteen inches, that " they may not eaſily be broken, ſeldom fail, by a variety of artifices, to impoſe on " their employers."

VIII.

ON THE MYSTICAL POETRY OF THE PERSIANS AND HINDUS.—

See the Works of Sir William Jones, Vol. I. p. 445.

GI'TAGO'VINDA; OR, THE SONGS OF JAYADE'VA.—

See the Works of Sir William Jones, Vol. I. p. 463.

NOTE

To face p. 461.

THE HINDU ECLIPTICK.

SRAVAN
ASHAR
JAISHT'H
VAISACH
CHAITR
PHALGUN
MAGH
PAUSH
AGRAHAYAN
CARTIC
ASWIN
BHADR

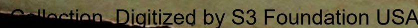
Pushya
Punarvasu
Ardra
Mrigasiras
Rohini
Critica
Bharaní
Aswiní
Révatí
Uphadrapada
P.bhadrapada
Satabhishà
Dhanisthà
Sravana
Abhijit
Uttaráshára
Púrváshára
Múla
Jyeshťhà
Anurádhà
Visáchà
Swatí
Chitrà
Hasta
Uphalguni
P.phalguni
Magha
Aslésha

90
60
30
360
330
300
270
240
210
180
150
120

TROPICK
EQUATOR

Hindu solar year begins.

January begins.



NOTE *on* p. 316, Vol. I. *Sir William Jones's Works.*

By the PRESIDENT.

A desire of translating the couplets of VARA'HAMIHIRA with minute exactness, and of avoiding the *Sanscrit* word *ayana* in an *English* phrase, has occasioned a little inaccuracy, or at least ambiguity, in the version of two very important lines, which may easily be corrected by twice reading *ádyát* in the *fifth* case for *ádyam* in the first: so that they may thus be translated word for word: " Certainly the southern " road of the sun was, *or began,* once from the middle of *Aslésha*; the northern, " from the first of *Dhanisht'há.* At present the *southern* road of the sun *begins* from " the first of *Carcata*; and the other from the first of *Mriga*, or *Macar.*"

IX.

ON THE INDIAN CYCLE OF SIXTY YEARS.

By SAMUEL DAVIS, *Esq.*

IN the Philosophical Transactions published for 1790, there is an account given of the *Hindu* cycle of sixty*, which being in many particulars deficient, and in some erroneous, I shall endeavour to shew the true nature and computation of that cycle, from the explanation which is given of it by the *Hindus* themselves.

The following two *slócas*, extracted from the last section of the *Súrya Siddhánta*, enumerate the several distinctions of time in astronomical use among the *Hindus*:

ব্রাহ্মং দৈবং তথা পিত্র্যং প্রাজাপত্যং গুরোস্তথা ।
সৌরং চসাবনং চান্দ্র মার্ক্ষং মানানি বৈ নব ।
চতুর্ভির্ব্যবহারোত্র সৌর চান্দ্রার্ক্ষ সাবনৈঃ ।
বার্হস্পত্যেন ষষ্ট্যব্দং জ্ঞেয়ং নান্যৈস্তু নিত্যশঃ ॥

* " In their current transactions, the inhabitants of the peninsula employ a mode of computation, which, though " not unknown in other parts of the world, is confined to these [the southern] people amongst the *Hindoos.* This is a " cycle or revolving period of sixty *solar years*, which has no further correspondence with the æras above mentioned [of " *Bikramajit* and *Salahan*] than that of their years respectively on *the same day.*" &c.
PHIL. TRANS. VOL. LXXX. Part ii.

Bráhman

Bráhman daivan tat'hà pitryan prájápatyan guróſtat'hà,

Sauran *che* ſávanan chándram árcſhan mánáni vai nava:

Chaturbhir vyavaháró'tra ſaurachándrárcſha ſávanaih,

Várhaſpatyéna ſhaſh'tyabdan jneyan nányaiſtunityas'ah:

and the tranſlation of them is as follows: "The *Bráhma*, the *Daiva*, the *Pitrya*, "the *Prájapatya*, that of *Guru*, the *Saura*, the *Sávana*, the *Chándra*, the *Nácſhatra*, are the nine diſtinctions of time. Four of thoſe diſtinctions are of practical uſe to mortals; namely, the *Saura*, the *Chándra*, the *Nácſhatra*, the *Sávana*. "That of *Vrihaſpati (Guru)* is formed into ſixty years. The other diſtinctions "occur but ſeldom in aſtronomical practice."

Brahma's *year* is that, whereof the *Calpa* is one day. The *Daiva* year conſiſts of 360 revolutions of the ſun through the ecliptick. The *Pitrya* day is from lunation to lunation. The *Prajápati-mána* is the *manwantara*. The cycle of *Guru* or *Vrihaſpati*, which is the ſubject of this paper, will be explained further on. The *Chándra* is lunar, and the *Nácſhatra* ſidereal time. The *Saura* and *Sávan*, are the ſame ſolar-ſidereal year differently divided; the ſun's paſſage through each degree of the ecliptick being accounted as a day of the firſt, and the time contained between ſun-riſe and ſun-riſe as a day of the laſt; conſequently, there are 360 days, or diviſions, in the former year; whereas, the latter year is determined, according to the aſtronomical rules of the beſt authority, as containing $365^{D}\ 15^{D}\ 31^{P}\ 31^{V.P}\ 24^{A.P}$ of *Hindu*, or $365^{D}\ 6^{H}\ 12^{M}\ 36''\ 33'''\ 36''''$ of our, time.

The *Sávan* year may, as the *Hindus* obſerve, be meaſured by the following method, which is little more than a tranſlation from the *Sanſcrit*.

Upon a large horizontal circle, note the point whereon the ſun riſes, at any time near the equinox, or, when his motion in declination is the moſt perceptible; and count the number of *Sávan* days, or of his ſucceſſive riſings, from that time; until having viſited the two ſolſtices, he ſhall be returned near to the original mark; then, repeat the operation, until he riſes next after paſſing over that original or firſt-made mark, and compute the proportion which the ſpace, whereby he ſhall have fallen ſhort of it, in the laſt obſervation but one, bears to the whole ſpace contained between the marks made of his two laſt riſings, accounting that ſpace to contain 60 *Dandas*, or one *Sávan* day: the reſult will be the fraction (allowing for preceſſion)

preceffion) of a day, and it will be the excefs of the year over 355 days, or number of times that the fun will have been found to rife above the horizon during fuch an obfervation of his progrefs through the ecliptick. This fraction the *Súrya Siddhánta* ftates as 0 15 31 31 24 (D D P V.P A.P), and the *Siddhánta Sirómani* as 0 15 30 22 30 (D D P V.P A.P); but it is not probable, that either quantity was determined by fo fimple and mechanical a method alone, or without recourfe to a feries of obfervations made at diftant periods.

The *Vrĭhafpati mána*, of which the cycle of fixty years is compofed, is thus defcribed in the comment on the foregoing *flócas:*

বৃহস্পতের্মানং মধ্যমরাশিভোগেনোক্তং ।।

Vrihafpetérmánan madhyamaráfibhógénóctan.

" It is his *(Vrihafpati*'s) mean motion (*madhyama)* through one fign *."

To explain what is meant by the *madhyama*, in contradiftinction to the *fighra*, motion of *Jupiter*, and the other planets, and to fhew that, by compounding them in eccentrick circles and epicycles, the *Hindus* compute the apparent places of the planets on the principles of the *Ptolemaick* aftronomy, is not the object of this paper: I fhall, therefore, only defire it may be underftood, that the *madhyama* of *Jupiter* anfwers to his mean motion in his orbit, and the amount of it computed for any particular interval, to his mean heliocentrick longitude in the *Hindu* ecliptick. The rule then for computing his *mána*, or year, of which the cycle of fixty years is formed, is evident; and it is thus given in the 55th *flóca* of the firft fection of the *Súrya Siddhánta*.

দ্বাদশঘ্নাগুরোর্যাতা ভগণা বর্ত্তমানকৈঃ ।
রাশিভিঃ সহিতাঃ শুদ্ধাঃ ষষ্ট্যা স্যুর্বিজয়াদয়ঃ ।।

Dwádafaghná guró yáta bhagáná vertamánacaih
Ráfibhih fahitáh fúddáh fhafhtyá fyurvijáyádayah

* Correct an error in p. 269, in the note on the *Hindu* cycle of fixty, for *degree* read *fign*.

" Multiply

"Multiply by 12 *Jupiter*'s expired *bhaganas* (revolutions), and (to the product) "add the sign he is in; divide (the sum) by 60; the remainder, or fraction, shows "his current year, counting from *Vijaya* as the first of the series."

To apply this rule in finding the *Vrihaspati* year, for a given time, as for the commencement of the current year of the *cali yug*, or when 4892 years of that era were expired, correspondent with the 10th of last *April*, we have the following data*. The revolutions or mean motion of *Jupiter*, 364220 in 4320000 solar years; and the term expired of the *cali yug* 4892 years, which, for the reason given in page 277, may in this case be used to save trouble, instead of the period expired of the *Calpa:* then, as 4320000 to 364220, so 4892 to $\overset{R}{412}\ \overset{S}{5}\ 10^{\circ}\ 21'\ 12''$ which shows *Jupiter*'s *madhyama* or mean heliocentrick longitude to be $\overset{S}{5}\ 10^{\circ}\ 21'\ 12''$ after 412 complete revolutions through his orbit. But as in the instance of the moon's node (see page 297), a correction of *bíja* is here to be applied to *Jupiter*'s mean place at the rate of 8 revolutions in the *mahá yug* substractive. But 8 revolutions in 4320000 years are as 1° to 1500 years; therefore by a shorter process, the term expired of the *cali yug*, divided by 1500, quotes the *bíja* in degrees; and $\frac{4892}{1500}=3^{\circ}\ 15'\ 41''\ 48'''$ is the correction substractive, which reduces *Jupiter*'s mean place to $(\overset{R}{412})\ \overset{S}{5}\ 7^{\circ}\ 5'\ 30''$: then $412\times12=4944$, to which add 6, *Jupiter* being in the sixth sign; the sum 4950 is the number of the *Vrĭhaspati* years elapsed since the beginning of the *cali yug*; which, divided by 60 for cycles, quotes 82 cycles expired, leaving a fraction of $\frac{30}{60}$ to find his current year, which, counted as the rule directs from *Vijaya* as the first, falls on *Dundubhi*, which is the 56th of the cycle; and, of this year, the fraction $7^{\circ}\ 5'\ 30''$ reduced at the rate of $2^{\circ}\ 30'$ to a month, shows $\overset{M}{2}\ \overset{D}{25}\ \overset{D}{6}\ \overset{P}{12}$ to have been expired on the 1st of *Vaiśách*, or the 10th of *April*, for which time the computation is made; and likewise, that the next year *Rudhiródgári* will commence in the ensuing solar month of *Mágha*.

A *Nádiya* almanack for the present year states, that on the 1st of last *Vaisach*, there were expired of the *Vrĭhaspati* cycle 55 years, 2 months, 23 days, and 10 *dandas*; and that the current year *Dundubhi* will continue until the 7th day of the solar month of *Mágh:* the difference of one day and 56 *dandas*, between this and the foregoing result, is too great to be accounted for by the difference of longitude be-

* From page 269.

tween

tween *Nadíya* and *Ujjein*, for the meridian of which latter place computations by the *Súrya Siddhánta* are made; but it is of no conſequence to the intended purpoſe of this paper.

There is another rule for computing the *Vrĭhaſpati* year given in an aſtrological book named *Jyautiſtatva*. "The *ſáca* years note down in two places. Multiply "(one of the numbers) by 22. Add (to the product) 4291. Divide (the ſum) "by 1875. The quotient add to the ſecond number noted down, and divide (the "ſum) by 60. The remainder or fraction will ſhow the year laſt expired, count-"ing from *Prabhava* as the firſt of the cycle. The fraction, if any, left by the "diviſor 1875 may be reduced to months, days, &c. expired of the current year."

The *ſáca* years expired on the 1ſt of laſt *Vaiſách*, correſponding with the expired years 4892 of the *cali yug*, were 1713: then, by the rule,

$$\frac{1713 \times 22 + 4291}{1875} = 22\tfrac{727}{1875}, \text{ and, } \frac{1713 + 22}{60} = 28\tfrac{55}{60}$$

which ſhows the laſt expired year of *Vrĭhaſpati* to have been the 55th year of the cycle named *Durmati*; and the fraction $\frac{727}{1875}$, when reduced, that 4 months, 19 days, and 35 *dandas* were expired of the current year *Dundubhi* when laſt *Vaiſácha* began.

The numbers 22 and 1875 uſed in this computation are evidently derived from the planetary periods, as given by A'RYÁBHATTA; which according to VARAHANIHIRA are, of *Jupiter*, 364224 mean revolutions in 4320000 ſolar years: but 364224 revolutions of *Jupiter* contain 4370688 of his years, which exceed the correſpondent ſolar years 4320000 by 50688; and thoſe two numbers reduced to their loweſt terms are 1875 and 22; or, in 1875 ſolar years, there is an exceſs of 22 *Vrĭhaſpati* years; and hence the uſe of thoſe numbers is obvious. The additive number 4892, by the *Hindu* aſtronomers termed *cſhépa*, adjuſts the computation to the commencement of the era *ſáca*, which began when the 3179th year expired of the *cali yug*; and it ſhows that 2 years, 3 months, and 13 days were then expired of the current cycle of *Jupiter*, or 3 months and 13 days of the year *Sucla*, which is the third of that cycle. A computation by the *Súrya Siddhánta* for the ſame period, with a correction of *bíja*, as in the foregoing example, makes 2 months, 9 days, 56 *dandas*, and 12 *palas* to have been elapſed of that year, and that conſequently there were 57 years, 9 months, 20 days, 3 *dandas*, and 12 *palas* then wanting to complete the cycle, inſtead of 49 years as it is ſtated in the Philoſophical Tranſactions;

tions; and, by the ſame rule, the year of CHRIST 1784 correſponded with the 48th and 49th cycle, or *Ananda* and *Rácſhaſa*.

This mode of computation diſagrees with the date of a grant of land mentioned in Vol. I. p. 535, *Sir William Jones*'s *Works*; for *ſáca* 939 muſt have ended in the 3d month of the 53d year of the *Vrĭhaſpati* cycle; but, as the grant in queſtion appears to have been made in the vicinity of *Bombay*, the difference may be accounted for in a manner, that will equally explain the diſagreement noticed by Mr. MARSDEN between his authorities and the *Banáres* almanack. We learn from VARA'HAMIHIRA's commentator, there were ſome who erroneouſly ſuppoſed the ſolar and *Vrihaſpati* years to be of the ſame length. A memorial *ſlóca* known to moſt *Pandits*, furniſhing a conciſe rule to find the *Vrĭhaſpati* year, mentions aſtronomers in countries ſouth of the *Nermadá* to be in their reckoning of it ten years behind thoſe ſituated on the north ſide of that river; by the foregoing compariſon of the date in the Aſiatick Reſearches with a computation by the *Súrya Siddhánta*, the difference is found to be 2 years; and the *Banáres* almanack for the preſent year mentions, that ſouth of the *Nermadá*, the 45th year of the cycle, named *Viródhacrit*, was accounted to begin in laſt *Mágh*; in which month, it is further obſerved, began at *Banáres* the preſent year *Dundubhi*, which is the 56th of the cycle. This difference then increaſes, and from the *ſáca* year 939, when it was 2 years, it had to laſt *Mágh* become 11 years. Now, in the interval of 773 ſolar years between thoſe points of time, the *Vrihaſpati* reckoning muſt have gained upon the ſolar reckoning about 9 years, which, added to the former difference of 2 years, is equal to the difference now actually noticed in the *Banáres* almanack; and we may thence conclude, that the erroneous notion mentioned and refuted by VARA'HAMIHIRA's commentator, ſtill prevails to the ſouth of the *Nermadá*, from which part of *India* Mr. MARSDEN's information on the ſubject ſeems to have been originally procured. But there is no reaſon to ſuppoſe, that the *Vrĭhaſpati* year is any where conſidered as "commencing on the ſame day with the years of VICRAMA'"DITYA and SA'LIVA'HAN;" nor is it poſſible that it ſhould; becauſe the latter, which is ſolar-ſidereal, commences with the ſun's entrance of *Aries* in the *Hindu* ecliptick; and the former, which is luni-ſolar, with the preceding new moon in the month of *Chaitra*.

It may not be deemed ſuperfluous here to add VARA'HAMIHIRA's explanation of *Jupiter*'s two cycles of 12 and 60; more eſpecially as he cites certain particulars with a reference

a reference to the poſition of the colures as deſcribed by PARA'SARA, and explained in the preceding volume of this work.

Text.—" *Of Vrĭhaſpati*'s 12 *years*. The name of the year is determined from " the *Nacſhatra*, in which *Vrĭhaſpati* riſes and ſets (heliacally) and they follow in " the order of the lunar months."

Commentary.—" But if, as it may happen, he ſhould ſet in one and riſe in " another *Nacſhatra*, which of the two, it may be aſked, would give name to his " year? Suppoſe him, for example, to ſet in *Róhini* and to riſe in *Mrigaſiras* :—I " anſwer, that in ſuch a caſe, the name muſt be made to agree with the order of " the months; or, it muſt be that name, which in the regular ſeries follows the " name of the year expired. According to SASIPUTRA and others, the *Nacſhatra* " in which *Jupiter* riſes gives the name to his year. CASYAPA ſays, the names of " the *Samvatſura Yuga*, and the years of the *cycle of ſixty*, are determined from the " *Nacſhatra* in which he *riſes*; and GARGA gives the ſame account. Some ſay, " that *Cartic*, the firſt year of the cycle of 12, begins on the firſt day of the month " of *Chaitr*, whatever may be the *Nacſhatra* which *Jupiter* is then in; and that " *Prabhava* likewiſe, the firſt year of the cycle of ſixty, begins in the ſame man- " ner; and ſome ſay that *Jupiter*'s years are coincident with the ſolar years; but " that cannot be true, becauſe the ſolar year exceeds in duration the *Vrĭhaſpati* " year," &c.

Text.—" The years beginning with *Cártic* commence with the *Nacſhatra Criticà*, " and to each year there appertain two *Nacſhatras*, except the 5th, 11th, and 12th " years, to each of which appertain three *Nacſhatras*."

Commentary.—" The years and their correſponding *Nacſhatras* are,"

YEARS	NACSHATRAS.
Cártic.	Criticà, Róhinì.
A'grahayan.	Mrigaſiras, A'rdrà.
Pauſh.	Punarvaſu, Puſhya.
Mágh.	Aſléſhá, Maghà.
Phálgun.	Purvap'halgunì, Uttarap'halgunì Haſta.
Chaitr.	Chitrà, Swáti.
Vaiſách.	Viſácha, Anurádhà.
Jyaiſhth.	Jyéſht'hà, Múla.
Aſhar.	Purvaſhárá, Uttaráſhára.
Srávan.	Sravanà, Dhaniſh't'hà.

Bhádr

Bhádr.	Satabhishà, Purvabhadrapadà, Uttarabhadrapada.
A'swin.	Révati, Aswinì, Bharanì.

" Some, on GARGA's authority, hold it to be the 10th instead of the 12th year " to which three *Nacshatras* appertain. GARGA's arrangement of them is thus."

Phálgun.	Purvap'halgunì, Uttarap'halgunì, Hasta.
Srávan.	Sravanà, Dhanish't'hà, Satabhishà.
Bhádr.	Purvabhadrapadà, Uttarabhadrapadà, Revati.
Aswin.	Aswinì, Bharanì.

" PARASERA's rule states, that when *Vrĭhaspati* is in

" *Criticà* and *Rohinì*, the year is - - - - - -	bad.
" *Mrigasiras, A'rdrà* - - - - - - - - -	bad.
" *Punarvasu, Pushya* - - - - - - - -	good.
" *Asléśha, Maghà* - - - - - - - - -	bad.
" *Purvap'halgunì, Uttarap'halgunì, Hasta* - - - - -	neutral.
" *Chitrà, Swáti* - - - - - - - - -	good.
" *Visáchà, Anurádhà* - - - - - - - -	bad.
" *Jyéśht'ha, Múla* - - - - - - - -	bad.
" *Purvashára, Uttarashára* - - - - - - -	good.
" *Sravanà, Dhanishthà, Satabhishà* - - - - - -	good.
" *Purvabhadrapadà, Uttarabhadrapadà, Revati* - - - -	good.
" *Aswinì, Bharanì* - - - - - - - - - -	good.

" On those authorities, therefore, it is the 10th and not the 12th year to which " three *Nacshatras* appertain."

Text.—" *Of the* Vrihaspati *cycle of sixty years.* Multiply the expired years of " *Saca* by 11, and the product by 4. Add the *chépa* 8589. Divide the sum by " 3750*; and the quotient add to the years of *Saca*. Divide the sum by 60 to find " the year, and by 12 to find the *yuga*. The *Dévas* who preside over the twelve " years of the *yuga* are,

" Vishnu,	*The Pitris*,
" Súrya,	Vis'wa.
" Indra,	Sóma.
" Agni,	Indrágni.

* These numbers, 11 × 4 and 3750 are in the same ratio as those used in the foregoing example from the *Jyautiśtatva*: the two rules therefore are the same, with an inconsiderable difference in the *cshépa*.

" Twashtà,

" Twaſhtà, A'ſwina.
" Ahivradna, Bhaga."

Commentary.—" It is in the *Sómaſanhitá* that the preſiding *Dévas* are thus ſtated. In the cycle of ſixty are contained five cycles of twelve; which five cycles, or " *yugas*, are named

" *Samvatſara*, over which preſides - - - - *Agni*.
" *Parivatſara* - - - - - - *Arca*.
" *Idavatſara* - - - - - - *Chandra*.
" *Anuvatſara* - - - - - - *Brahmà*.
" *Udravatſara* - - - - - - *Siva*.

Text.—" The firſt year of the cycle of ſixty, named *Prabhava*, begins, when in the month of *Mágha*, *Vrĭhaſpati* riſes in the firſt degree of the *Nacſhatra Dhan-* " *iſht'hà*; and the quality of that year is always good."

Commentary.—" The month of *Mágh* here meant is the lunar *Mágh:* it cannot " be the ſolar *Mágh*, becauſe when *Vrĭhaſpati* riſes in $9^s\ 23^\circ\ 20'$ *Súrya* muſt be in " $10^s\ 6^\circ\ 12'$*."

The years of the cycle and the preſiding *Deities* are thus arranged by VARA'HAMIHIRA in ſix memorial couplets.

BRA'HMA.	VAISHNAVA.	SAIVA.
Prabhava,	Bahudhanya,	Viródhi,
Vibhava,	Pramát'hi,	Vicrita,
Sucla,	Vicrama,	25. C'hara,
Pramóda,	15. Briſya,	Nandana,
5. Prajápati,	Chitrabhánu,	Vijaya,
Angira,	Subhánu,	Jaya,
Srímuc'ha,	Tárana,	Manmat'ha,
Bhává,	Párthiva,	30. Durmuc'ha,
Yuvà,	20. Vyaya,	Hémalamva,
10. Dhátá,	Sarvajit,	Vilamva,
Iſwara,	Sarvadhári,	Vicári,

* Becauſe the beginning of *Dhaniſht'hà* is weſt of the end of *Mágh* only 6° 40', at which diſtance from the ſun, *Jupiter* would not riſe heliacally, or be ſeen diſengaged from his rays; but the lunar *Mágh* might extend to near the end of the ſolar *Phálgun*. Should the moon, however, change very ſoon after the ſun's entrance of the *Hindu* ſign *Capricorn*, coincident with *Mágh*, then, neither the ſolar nor the lunar month of that name would agree with the terms of the propoſition; which is an inſtance of an imperfect aſtronomy.

Sarvari,
35. Plava,
Subhacrit,
Sóbhana,
Crádhi,
Viſwávaſu,
40. Parábhava,
Plàvanga,
Cílaca,
Saumya,
Sádhárana,
45. Viródhacrit,
Paridhávi,
Pramádi,
A'nanda,
Rácſhaſa,
50. Anala,
Pingala,
Cálayucta,
Sidhárthi,
Raudra,
55. Durmati,
Dundubhi,
Rudhiródgári,
Ractácſha,
Oródhana,
60. Cſhaya.

It may be remarked, that, in the foregoing arrangements of the *Vrĭhaſpati* years, *Cártic* is always placed the firſt in the cycle of twelve; and, ſince it is a main principle of the *Hindu* aſtronomy to commence the planetary motions, which are the meaſures of time, from the ſame point of the ecliptick, it may thence be inferred, that there was a time when the *Hindu* ſolar year, as well as the *Vrĭhaſpati* cycle of twelve, began with the ſun's arrival in, or near, the *Nacſhatra Criticà*. That this year has had different beginnings is evinced by the practice of the *Chineſe* and *Siameſe*, who had their aſtronomy from *India*, and who ſtill begin their years, probably by the rule they originally received, either from the ſun's departure from the winter ſolſtice, or from the preceding new moon, which has the ſame reference to the winter ſolſtice that the *Hindu* year of VICRAMA'DITYA has to the vernal equinox. The commentator on the *Súrya Siddhánta* expreſsly ſays, that the authors of the books generally termed *Sanhitás*, accounted the *Déva* day to begin in the beginning of the ſun's northern road: now, the *Déva* day is the ſolar year; and the ſun's northern road begins in the winter ſolſtice; and hence it ſhould ſeem, that ſome of thoſe authors began the ſolar year exactly as the *Chineſe* do at this time. This might moreover have been the cuſtom in PARA'SARA's time; for the phenomenon, which is ſaid to mark the beginning of the *Vrĭhaſpati* cycle of ſixty, refers to the beginning of *Daniſht'ha*, which is preciſely that point of the ecliptick through which the ſolſtice paſſed when he wrote.

There are, beſide theſe apparent changes made by the *Hindus* in their mode of commencing the year, abundant inſtances of alterations and corrections in their aſtronomy, an inquiry into which might, by fixing certain chronological data, throw conſiderable light on their hiſtory; and it is ſcarcely neceſſary to obſerve, with how much more advantage an inveſtigation of this kind would be made with the

aſſiſtance

aſſiſtance of ſuch aſtronomical books, written in the *Déva Nagari* characters, as might eaſily be had from *Haidarábad* and *Púna*, if the *Engliſh* reſidents there would intereſt themſelves to procure them. Copies of the aſtronomical rules, followed at *Bombay* and *Gujarat*, might alſo prove of uſe, if NIEBUHR * was not miſinformed, who ſays the natives there begin the year with the month of *Cártic*, which has an evident reference to the autumnal equinox, and may perhaps be computed by the *Arſha Siddhánta*, mentioned in Vol. I. as accounting the day to begin at ſunſet; for ſunſet with the *Dévas* is the ſun's departure from the autumnal equinox, and it is invariably obſerved in their aſtronomy to account the different meaſures of time as having begun originally from the ſame inſtant.

But of all places in *India*, to which *Europeans* might have acceſs, *Ujjein* is probably the beſt furniſhed with mathematical and aſtronomical productions; for it was formerly a principal ſeminary of thoſe ſciences, and is ſtill referred to as the firſt meridian. Almoſt any trouble and expence would be compenſated by the poſſeſſion of the three copious treatiſes on Algebra, from which BHA'SCARA declares he extracted his *Bíja Genita*, and which in this part of *India* are ſuppoſed to be entirely loſt. But the principal object of the propoſed inquiry would be, to trace as much as poſſible of that gradual progreſs, whereby the *Hindu* aſtronomy has arrived at its preſent ſtate of comparative perfection; whence might be formed more probable conjectures of its origin and antiquity than have yet appeared: for I imagine, there are few of M. BAILLY's opinion that the *cali yug*, or any *yug*, had its origin, any more than our *Julian* period, in *an actual obſervation*, who have conſidered the nature and uſe of thoſe cycles, of the relative *bhaganas*, or revolutions of the planets, and the alterations † which the latter have at different times undergone; concerning which ſeveral particulars M. BAILLY, it muſt be acknowledged, had but little information ‡. What was the real poſition of the planets and the ſtate of aſtronomy when the *cali yug* began, or 4892 years ago, will probably never

* " Le nouvel an chez les *Indiens* à *Guzerat*, que ceux de *Bombay* ſuivent auſſi, vient du mois *Kartig*, mais à *Scindi* " on le célébré au mois *Aſar*." Tom. ii. p. 21.

† Inſtances in *Jupiter*'s mean motion. A'RYABHATTA gave the revolutions as 364224 in 4320000 ſolar years. BHA'SCAR in his *Sirómani* 364226455 in 4320000000 ſolar years. The *Súrya Siddhánta* 364220 in 4320000 ſolar years; which latter, by the *bíja* introduced ſince, are reduced to 364212 in the ſame period.

‡ But it is not thence to be inferred, that the *Hindus* did *not* exiſt as a nation, or that they made *no* obſervations of the heavens as long ago as 4890 years: all that is here meant is, that the obſervation aſcribed to them by M. BAILLY does not neceſſarily follow from any thing that is known of their aſtronomy; but, on the contrary, from the nature of the ſubject it appears, that the *Cali yug* was, like the *Julian* period, fixed by retroſpective computation; which might ſtill have happened although aſtronomy had originated, which is not at all improbable, in much higher antiquity.

Neither

never be known; but the latter muſt certainly have undergone conſiderable improvement ſince the laſt quoted *ſlóca* of VARA'HAMIHIRA was received as a rule; for it ſuppoſes the mean motion of *Jupiter* to be to that of the ſun, as 60 to ſome integer; apparently to 720; as 5 to 60, or as 1 to 12; without which, the beginning and ſucceſſive returns of the cycle of ſixty could never be denoted by the heliacal riſing of *Jupiter* in *Dhaniſht'hà*, or in any conſtant point of the zodiack; and at a time when the mean motion of *Jupiter* was ſo much miſtaken, it may reaſonably be ſuppoſed, that the more difficult parts of aſtronomy were very imperfectly underſtood. If the ratio were as 1 to 12, which is implied by the *yuga* of twelve (for the term *yuga* means conjunction, or coincidence), then a conjunction of the ſun and *Jupiter* would happen at the end of every period of twelve years in the ſame point of the zodiack, and the cycle of ſixty might begin in the manner deſcribed: but this muſt long ſince have ceaſed to be the rule, or at leaſt ſince the time of A'RYABHATTA; for, if the cycle be ſuppoſed to begin with the ſun and *Jupiter* in *Dhaniſht'hà*, then in ſixty of *Jupiter*'s years that planet will again be in *Dhaniſht'hà*; but, in ſixty of ſuch years there are, by the data aſcribed to A'RYABHATTA, only 59 years, 3 months, and ſome days of ſolar time; the next cycle, therefore, could not have the ſame beginning, becauſe the ſun would be found more than 90 degrees diſtant from *Jupiter*'s mean place, and in 60 years more that diſtance would be doubled. As this diſagreement with the rule could not have been unknown to VARA'HAMIHIRA, who gives the *bhaganas* from A'RYABHATTA as 364224 in 4320000 ſolar years, he may be ſuppoſed to have only cited what he had learned from other treatiſes merely as an aſtrological maxim, his *Sanhità* being a treatiſe on *aſtrology* not on practical *aſtronomy*; and this conjecture will appear the more reaſonable, when it is conſidered, that notions wholly incon-

Neither LE GENTIL, nor BAILLY, had any other authority for placing the origin of the *Hindu* zodiack in longitude
10s 6°, at the beginning of the *cali yug*, than reſults from a computation of the preceſſion for 3600 years, at the end of
which expired term of the *cali yug*, it coincided with the equinox: it is certain, that the *Bráhmens* in this part of *India*
ſuppoſe, as their aſtronomy implies, a ſimilar coincidence, together with a conjunction of the planets in the ſame point
by their mean motions when the *cali yug* began; and ſince in the preſent amount of the preceſſion, and conſequently in
the origin of the zodiack, as well as in many other particulars, the *Bráhmens* of *Trivalore* agree with thoſe of *Bengal*, it
is not at all probable, that they ſhould have different ſyſtems. But M. BAILLY thinks the *Indian* zodiack has had two
origins; one of them as I deſcribe it, the other, as he computes it from the beginning of the *cali yug*:—it may indeed
have had many origins, although there ſeems at preſent but one to be found; for it is not in the leaſt inconſiſtent with
the principles of the *Hindu* aſtronomy to ſuppoſe that, if ever an alteration took place in the mode of beginning the
year, ſome alteration was at the ſame time made in the origin of the zodiack likewiſe. The origin of the *Chineſe* zodiack
is deſcribed to be in a part of the heavens oppoſite to that of the *Hindus*; for *Spica* diſtinguiſhes their conſtellation *Kiv*,
which is the firſt of their twenty-eight lunar manſions; and ſince it is agreed, that both ſyſtems were originally the
ſame, a conſiderable alteration, with reſpect to the origin of the zodiack, muſt neceſſarily have happened in one of
them.

ſiſtent

ſiſtent with the latter, and which muſt have originated in remote ages, when ſcience of any kind had made but ſmall progreſs, are ſtill preſerved in different *ſáſtras*; as in the *Bhágavat*, which, treating on the ſyſtem of the univerſe, places the moon above the ſun, and the planets above the fixed ſtars.

To render this paper more intelligible, I have ſubjoined a diagram of the *Hindu* ecliptick, which may alſo ſerve to illuſtrate ſome aſtronomical papers in the preceding volume. Its origin is conſidered as diſtant 180 degrees in longitude from *Spica:* a ſtar, which ſeems to have been of great uſe in regulating their aſtronomy, and to which the *Hindu* tables of the beſt authority, although they differ in other particulars, agree in aſſigning ſix ſigns of longitude counted from the beginning of *Aſwiní*, their firſt *Nacſhatra.* From the beginning of *Aſwiní* (according to the *Hindu* preceſſion, now 19° 22′, but which is in reality ſomething further diſtant from the vernal equinox) the ecliptick is divided into twenty-ſeven equal parts, or *Nacſhatras*, of 13° 20′ each; the twenty-eighth, named *Abhijit*, being formed out of the laſt quarter of *Uttaraſhára*, and as much of *Sravaná* as is neceſſary to complete the moon's periodical month. The years of *Jupiter*'s cycle are expreſſed in their order with numerals: *a* is the former poſition of the colures, as explained in Vol. II. and *b, c*, mark the limits of the preceſſion reſulting from the *Hindu* method of computing it. The outer dotted circle is the *European* ecliptick, in which is noted the beginning of the *Hindu*, and likewiſe of the *European* year. For want of room the ſigns are diſtinguiſhed in both with the uſual characters. The two ſtars pointed out by the moſt ſkilful *Pandit* I have yet met with, as diſtinguiſhing *Aſwiní*, are β and γ *Arietis*, which diſtinguiſh alſo *al ſharatán*, the firſt *Arabian menzil*; and the latter is ſaid to be the *yóga*, whoſe longitude and latitude are ſtated certainly with great incorrectneſs, as 8° and 10° north; but the error, if it be not owing to tranſcribers, is inexplicable.

The ſolar months, it may be obſerved, correſpond in name with the like number of *Nacſhatras:* this is aſcribed to the months having been originally lunar, and their names derived from the *Nacſhatras*, in which the moon, departing from a particular point, was obſerved to be at the full; for, although the full moon did not always happen in thoſe particular *Nacſhatras*, yet the deviation never exceeded the preceding or the ſucceeding *Nacſhatra*; and whether it fell in *Haſta*, *Chitra*, or *Swáti*, ſtill that month was named *Chaitrà*; and ſo of the reſt. This is the explanation of the month given by NRISINHA, who in the ſame manner explains *Jupiter*'s cycle of twelve

twelve years, the names of which could not always correſpond with thoſe of the *Nacſhatras*, in which he roſe heliacally.

Of the *Hindu* method of intercalating the lunar month, M. BAILLY conceived a right idea from what P. DU CHAMP had ſaid on the ſubject; but he has omitted to mention a curious circumſtance conſequent to it, which is, that ſometimes there happen *two* intercalary months in the ſame year; or, to be more preciſe, *two* lunar months are named *twice* over: thus, as was actually the caſe in 1603 *Sáca*, there may be two lunar *Aſwinas* and two *Chaitras*; but then ſome one intervening month, as *Agrahâyan*, would be omitted, becauſe the change of the moon would not happen at all during the ſolar month of that name. During the preſent poſition of the ſun's apſis, this *ch'che* (cſhaya?) or diſcarded month, is limited to *Agrahâyan*, *Pauſh* or *Mágh*, thoſe being the three ſhorteſt ſolar months; and, by the *Hindu* computation, the diſcarded month will again fall on *Agrahâyan* in 1744 *Sáca*.

Bhâgalpur, 1 *Dec.* 1791.

X.

AN ACCOUNT OF THE METHOD OF CATCHING WILD ELEPHANTS AT TIPURA.

By JOHN CORSE, *Eſq.*

IN the month of *November*, when the weather has become cool, and the ſwamps and marſhes, formed by the rains in the five preceding months, are leſſened, and ſome of them dried up, a number of people are employed to go in queſt of elephants.

At this ſeaſon the males come from the receſſes of the foreſt into the borders and outſkirts thereof, whence they make nocturnal excurſions into the plains in ſearch of food, and where they often deſtroy the labours of the huſbandman, by devouring and trampling down the rice, ſugar canes, &c. that they meet with. A herd or drove of elephants, from what I can learn, has never been ſeen to leave the woods;

woods: ſome of the largeſt males often ſtray to a conſiderable diſtance, but the young ones always remain in the foreſt under the protection of the *Palmai* or leader of the herd, and of the larger elephants. The *Goondahs*, or large males, come out ſingly, or in ſmall parties, ſometimes in the morning, but commonly in the evening, and they continue to feed all night upon the long graſs, that grows amidſt the ſwamps and marſhes, and of which they are extremely fond. As often, however, as they have an opportunity, they commit depredations on the rice fields, ſugar canes, and plantain trees, that are near, which oblige the farmers to keep regular watch, under a ſmall cover, erected on the tops of a few long bamboos, about 14 feet from the ground: and this precaution is neceſſary to protect them from the tigers, with which this province abounds. From this lofty ſtation the alarm is ſoon communicated from one watchman to another and the neighbouring villages, by means of a rattle with which each is provided. With their ſhouts and cries, and noiſe of the rattles, the elephants are generally ſcared and retire. It ſometimes however happens that the males advance even to the villages, overturn the houſes, and kill thoſe who unfortunately come in their way, unleſs they have had time to light a number of fires: this element ſeems to be the moſt dreaded by wild elephants, and a few lighted wiſps of ſtraw or graſs ſeldom fail to ſtop their progreſs. To ſecure one of the males a very different method is employed from that which is taken to ſecure a herd: the former is taken by *Koomkees*, or female elephants trained for the purpoſe, whereas the latter is driven into a ſtrong encloſure called a *Keddah*.

As the hunters know the places where the elephants come out to feed, they advance towards them in the evening with four *Koomkees*, which is the number of which each hunting party conſiſts: when the nights are dark, and theſe are the moſt favourable for their purpoſe, the male elephants are diſcovered by the noiſe they make in cleaning their food, by whiſking and ſtriking it againſt their fore-legs, and by moon-light they can ſee them diſtinctly at ſome diſtance.

As ſoon as they have determined on the *Goondah* they mean to ſecure, three of the *Koomkees* are conducted ſilently and ſlowly by their *Mahotes* (drivers) at a moderate diſtance from each other, near to the place where he is feeding; the *Koomkees* advance very cautiouſly, feeding as they go along, and appear like wild elephants that had ſtrayed from the jungle. When the male perceives them approaching, if he takes the alarm and is viciouſly inclined, he beats the ground with his trunk and makes a noiſe, ſhewing evident marks of his diſpleaſure, and that he will not allow them

them to approach nearer; and if they perſiſt, he will immediately attack and gore them with his tuſks: for which reaſon they take care to retreat in good time. But ſhould he be amorouſly diſpoſed, which is generally the caſe (as theſe males are ſuppoſed to be driven from the herd at a particular period by their ſeniors, to prevent their having connection with the females of that herd), he allows the females to approach, and ſometimes even advances to meet them.

When from theſe appearances, the *Mahotes* judge that he will become their prize, they conduct two of the females, one on each ſide cloſe to him, and make them advance backwards, and preſs gently with their poſteriors againſt his neck and ſhoulders: the third female then comes up and places herſelf directly acroſs his tail: in this ſituation, ſo far from ſuſpecting any deſign againſt his liberty, he begins to toy with the females and careſs them with his trunk. While thus engaged, the fourth female is brought near, with ropes and proper aſſiſtants, who immediately get under the belly of the third female, and put a ſlight cord (the *Chilkah)* round his hind legs; ſhould he move, it is eaſily broken, in which caſe, if he takes no notice of this ſlight confinement, nor appears ſuſpicious of what was going forward, the hunters then proceed to tie his legs with a ſtrong cord (called *Bunda)* which is paſſed alternately, by means of a forked ſtick and a kind of hook, from one leg to the other, forming the figure of 8, and as theſe ropes are ſhort, for the convenience of being more readily put around his legs, 6 or 8 are generally employed, and they are made faſt by another cord (the *Dagbearee)* which is paſſed a few turns perpendicularly between his legs, where the folds of the *Bundahs* interſect each other. A ſtrong cable (the *Phand)* with a running nooſe, 60 cubits long, is next put round each hind leg immediately above the *Bundahs*, and again, above them, 6 or 8 additional *Bundahs*, according to the ſize of the elephant, are made faſt, in the ſame manner as the others were: the putting on theſe ropes generally takes up about 20 minutes, during which the utmoſt ſilence is obſerved, and the *Mahotes*, who keep flat upon the necks of the females, are covered with dark-coloured cloths, which ſerve to keep them warm, and at the ſame time do not attract the notice of the elephant. While the people are buſily employed in tying the legs of the *Goondah*, he careſſes ſometimes one, and ſometimes another of the ſeducers *(Kootnee)*, examining their beauties and toying with different parts, by which his deſires are excited and his attention diverted from the hunters, and in theſe amorous dalliances he is indulged by the females. But if his paſſions ſhould be ſo rouſed, before his legs are properly ſecured, as to induce him to attempt leaping on one of the females,

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the *Mahote*, to enſure his own ſafety and prevent him gratifying his deſires any farther, makes the female run away, and at the ſame time, by raiſing his voice and making a noiſe, he deters the *Goondah* from purſuing. This however happens very ſeldom; for he is ſo ſecured by the preſſure of a *Koomkee* on each ſide and one behind, that he can hardly turn himſelf, or ſee any of the people, who always keep ſnug under the belly of the third female, that ſtands acroſs his tail, and which ſerves both to keep him ſteady and prevent his kicking any of the people, who are employed in ſecuring him; but in general he is ſo much taken up with his decoyers, as to attend very little to any thing elſe. In caſe of accidents, however, ſhould the *Goondah* break looſe, the people upon the firſt alarm can always mount on the backs of the tame elephants, by a rope that hangs ready for the purpoſe, and thus get out of his reach. When his hind legs are properly ſecured, they leave him to himſelf, and retire to a ſmall diſtance: as ſoon as the *Koomkees* leave him, he attempts to follow, but finding his legs tied, he is rouſed to a proper ſenſe of his ſituation, and retreats toward the jungle; the *Mahotes* follow at a moderate diſtance from him on the tame elephants, accompanied by a number of people that had been previouſly ſent for, and who, as ſoon as the *Goondah* paſſes near a ſtout tree, make a few turns of the *Phands*, or long cables that are trailing behind him, around its trunk; his progreſs being thus ſtopped, he becomes furious and exerts his utmoſt force to diſengage himſelf, nor will he then allow any of the *Koomkees* to come near him, but is outrageous for ſome time, falling down and goring the earth with his tuſks. If by theſe exertions the *Phands* are once broken, which ſometimes is effected, and he eſcapes into the thick jungle, the *Mahotes* dare not advance for fear of the other wild elephants, and are therefore obliged to leave him to his fate; and in this hampered ſituation, it is ſaid, he is even ungenerouſly attacked by the other wild elephants. As the cables are very ſtrong and ſeldom give way, when he has exhauſted himſelf by his exertions, the *Koomkees* are again brought near and take their former poſitions, viz. one on each ſide and the other behind. After getting him nearer the tree, the people carry the ends of the long cables around his legs, then back and about the trunk of the tree, making, if they can, two or three turns, ſo as to prevent even the poſſibility of his eſcape. It would be almoſt impoſſible to ſecure an elephant in any other manner, as he would tear up any ſtake, that could at the time be driven into the ground, and even the noiſe of doing it would frighten the elephant: for theſe reaſons, as far as I can learn, nothing leſs than a ſtrong tree is ever truſted to by the hunters. For ſtill farther ſecurity, as well as to confine him

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from moving to either ſide, his fore-legs are tied exactly in the ſame manner as the hind-legs were, and the *Phands* are made faſt one on each ſide, to trees, or ſtakes driven deep into the earth. During the proceſs of tying both the hind and fore legs, the fourth *Koomkee* gives aſſiſtance where neceſſary, and the people employed cautiouſly avoid going within reach of his trunk; and when he attempts to ſeize them, they retreat to the oppoſite ſide of the *Koomkees*, and get on them, if neceſſary, by means of the rope above mentioned, which hangs ready for them to lay hold of. Although, by theſe means, he is perfectly ſecured and cannot eſcape, yet as it would be both unſafe and inconvenient to allow him to remain in the verge of the jungle, a number of additional ropes are afterwards put on, as ſhall be mentioned, for the purpoſe of conducting him to a proper ſtation. When the *Goondah* has become more ſettled, and eat a little food, with which he is ſupplied as ſoon as he is taken, the *Koomkees* are again brought near, and a ſtrong rope *(Phara)* is then put twice round his body, cloſe to his fore-legs like a girth, and tied behind his ſhoulder; then the long end is carried back cloſe to his rump and there faſtened after a couple of turns more have been made round his body. Another cord is next faſtened to the *Phara* and from thence carried under his tail like a crupper *(Dooblah)*, and brought forward and faſtened by a turn or two, to each of the *Pharas* or girths, by which the whole is connected, and each turn of theſe cords ſerves to keep the reſt in their places. After this a ſtrong rope (the *Tooman)* is put round his buttocks and made faſt on each ſide to the girth and crupper, ſo as to confine the motion of his thighs and prevent his taking a full ſtep. Theſe ſmallar ropes being properly adjuſted, a couple of large cables (the *Dools)* with running nooſes are put around his neck, and after being drawn moderately tight, the nooſes are ſecured from running cloſer, and then tied to the ropes on each ſide forming the girth and crupper already mentioned; and thus all theſe ropes are connected and kept in their proper places, without any riſk of the nooſes of the *Dools* becoming tight, ſo as to endanger the life of the elephant in his exertions to free himſelf. The ends of theſe cables are made faſt to two *Koomkees*, one on each ſide of the *Goondah*, by a couple of turns round the belly, cloſe to the ſhoulder, like a girth, where a turn is made, and it is then carried acroſs the cheſt and faſtened to the girth on the oppoſite ſide. Every thing being now ready, and a paſſage cleared from the jungle, all the ropes are taken from his legs, and only the *Tooman* remains round his buttocks to confine the motion of his hind-legs: the *Koomkees* pull him forward by the *Dools*, and the people from behind urge him on. Inſtead of advancing in the direction

rection they wifh, he attempts to retreat farther into the jungle, he exerts all his force, falls down, and tears the earth with his tufks, fcreaming and groaning, and by his violent exertions often hurts and bruifes himfelf very much, and inftances happen of their furviving thefe violent exertions only a few hours, or at moft a few days. In general, however, they foon become reconciled to their fate, will eat immediately after they are taken, and, if neceffary, may be conducted from the verge of the jungle as foon as a paffage is cleared. When the elephant is brought to his proper ftation and made faft, he is treated with a mixture of feverity and gentlenefs, and in a few months (if docile) he becomes tractable and appears perfectly reconciled to his fate. It appears fomewhat extraordinary, that though the *Goondah* ufes his utmoft force to difengage himfelf when taken, and would kill any perfon coming within his reach, yet he never, or at leaft feldom, attempts to hurt the females that have enfnared him, but on the contrary feems pleafed (as often as they are brought near, in order to adjuft his harneffing, or move and flacken thofe ropes which gall him), foothed and comforted by them, as it were, for the lofs of his liberty. All the elephants, foon after they are taken, are led out occafionally for exercife by the *Koomkees*, which attend for that purpofe.

Having now related, partly from my own knowledge and partly from comparing the accounts given by different people employed in this bufinefs, the manner in which the male elephants, called *Goondahs*, are fecured, I fhall next, entirely from my own knowledge, defcribe the methods I have feen employed for fecuring a herd of wild elephants. Female elephants are never taken fingly, but always in the herd, which confifts of young and old of both fexes. This noble, docile, and ufeful animal, feems naturally of a focial difpofition, as a herd in general confifts of from about 40 to 100, and is conducted under the direction of one of the oldeft and largeft females, called the *Palmai*, and one of the largeft males. When a herd is difcovered, about 500 people are employed to furround it, who divide themfelves into fmall parties, called *Chokeys*, confifting generally of one *Mahote* and two *Coolies*, at the diftance of twenty or thirty yards from each other, and form an irregular circle in which the elephants are enclofed: each party lights a fire and clears a footpath to the ftation that is next him, by which a regular communication is foon formed through the whole circumference from one to the other. By this path reinforcements can immediately be brought to any place where an alarm is given: and it is alfo neceffary for the fuperintendants, who are always going round, to fee that the people are alert upon their pofts. The firft circle (the *Dawkee*) being thus formed, the

the remaining part of the day and night is ſpent in keeping watch by turns or in cooking for themſelves and companions. Early next morning, one man is detached from each ſtation, to form another circle in that direction, where they wiſh the elephants to advance. When it is finiſhed, the people, ſtationed neareſt to the new circle, put out their fires and file off to the right and left, to form the advanced party, thus leaving an opening for the herd to advance through, and by this movement both the old and new circle are joined and form an oblong. The people from behind now begin ſhouting and making a noice with their rattles, *tomtoms*, &c. to cauſe the elephants to advance: and as ſoon as they are got within the new circle, the people cloſe up, take their proper ſtations, and paſs the remaining part of the day and night as before. In the morning the ſame proceſs is repeated, and in this manner the herd advances ſlowly in that direction, where they find themſelves leaſt incommoded by the noiſe and clamour of the hunters, feeding, as they go along, upon branches of trees, leaves of bamboos, &c. which come in their way. If they ſuſpected any ſnare, they could eaſily break through the circle: but this inoffenſive animal, going merely in queſt of food, and not ſeeing any of the people who ſurround him, and who are concealed by the thick jungle, advances without ſuſpicion, and appears only to avoid being peſtered by their noiſe and din. As fire is the thing elephants ſeem moſt afraid of in their wild ſtate, and will ſeldom venture near it, the hunters always have a number of fires lighted, and particularly at night, to prevent the elephants coming too near, as well as to cook their victuals and keep them warm. The ſentinels ſupply theſe fires with fuel, eſpecially green bamboos, which are generally at hand, and which, by the crackling and loud report they make, together with the noiſe of the watchmen, deter the elephants from coming near; ſo that the herd generally remains at a diſtance near the centre of the circle. Should they at any time advance, the alarm is given, and all the people immediately make a noiſe and uſe their rattles, to make them keep at a greater diſtance. In this manner they are gradually brought to the *Keddah*, or place where they are to be ſecured. As the natives are extremely ſlow in their operations, they ſeldom bring the herd above one circle in a day, except on an emergency, when they exert themſelves and advance two circles. They have no tents or covering but the thick woods, which, during the day, keep off the rays of the ſun; and at night they ſleep by the fires they have lighted, upon mats ſpread on the ground, wrapt up in a piece of coarſe cloth. The ſeaſon is then ſo mild that the people continue very healthy, and an accident ſeldom happens except to ſtragglers about the outſkirts of the wood, who

who are ſometimes, though very rarely, carried off by tigers. The *Keddah*, or place where the herd is to be ſecured, is differently conſtructed in different places; here it conſiſts of three encloſures communicating with each other by means of narrow openings or gateways. The outer encloſure, or the one next to the place where the elephants are to enter, is the largeſt; the middle one is generally, though not always, the next in ſize, and the third or furthermoſt is the ſmalleſt: theſe proportions, however, are not always adhered to in the making of a *Keddah*, nor indeed does there appear to me any reaſon for making three encloſures; but as my intentions are merely to relate facts, I ſhall proceed to obſerve, that when in the third or laſt encloſure, the elephants are then only deemed ſecure: here they are kept ſix or eight days, and are regularly, though ſcantily, fed from a ſcaffold on the outſide, cloſe to the entrance of an outlet called the *Roomee*, which is about ſixty feet long, and very narrow, and through which the elephants are to be taken out one by one. In many places this mode is not adopted; for as ſoon as the herd has been ſurrounded by a ſtrong paliſade, *Koomkees* are ſent in with proper people, who tie them on the ſpot, in the ſame manner as was mentioned above of the *Goondahs*, or male elephants, they are taken ſingly. Theſe encloſures are all pretty ſtrong, but the third is the ſtrongeſt, nor are the elephants deemed ſecure, as already obſerved, till they have entered it. This encloſure has, like the other two, a pretty deep ditch on the inſide; and upon the bank of earth, that is thrown up from the excavation, a row of ſtrong paliſades of middle-ſized trees is planted, ſtrengthened with croſs bars, which are tied to them about the diſtance of fourteen inches from each other; and theſe are ſupported on the outſide by ſtrong poſts like buttreſſes, having one end ſunk in the earth and the other preſſing againſt the croſs bars to which they are faſtened. When the herd is brought near to the firſt encloſure, or *Baigcote*, which has two gateways towards the jungle, from which the elephants are to advance (theſe as well as the other gateways are diſguiſed with branches of trees and bamboos ſtuck in the ground, ſo as to give them the appearance of a natural jungle), the greateſt difficulty is to get the herd to enter the firſt or outer encloſure; for notwithſtanding the precautions taken to diſguiſe both the entries as well as the paliſade which ſurrounds this encloſure, the *Palmai*, or leader, now appears to ſuſpect ſome ſnare, from the difficulty and heſitation with which in general ſhe paſſes into it; but as ſoon as ſhe enters, the whole herd implicitly follows. Immediately, when they are all paſſed the gateway, fires are lighted round the greateſt part of the encloſure, and particularly at the entries, to prevent the elephants from returning. The hunters

hunters from without then make a terrible noise by shouting, beating of *tomtoms* (a kind of drum), firing blunt cartridges, &c. to urge the herd on to the next enclosure. The elephants, finding themselves ensnared, scream and make a noise; but, seeing no opening except the entrance to the next enclosure, and which they at first generally avoid, they return to the place through which they lately passed, thinking perhaps to escape, but now find it strongly barricaded; and, as there is no ditch at this place, the hunters, to prevent their coming near and forcing their way, keep a line of fire constantly burning all along where the ditch is interrupted, and supply it with fuel from the top of the palisade, and the people from without making a noise, shouting and hallooing to drive them away. Wherever they turn, they find themselves opposed by burning fires or bundles of reeds, and dried grass, which are thrust through the opening of the palisades, except towards the entrance of the second enclosure or *Doobrazecote*. After traversing the *Baigcote* for some time, and finding no chance of escaping but through the gateway into the next enclosure, the leader enters, and the rest follow: the gate is instantly shut by people who are stationed on a small scaffold immediately above it, and strongly barricaded, fires are lighted, and the same discordant din made and continued, till the herd has passed through another gateway into the last enclosure, or *Rajecote*, the gate of which is secured in the same manner as the former was. The elephants, being now completely surrounded on all sides, and perceiving no outlet through which they can escape, appear desperate, and in their fury advance frequently to the ditch, in order to break down the palisade, inflating their trunks, screaming louder and shriller than any trumpet, sometimes grumbling like the hollow murmur of distant thunder, but, wherever they make an attack, they are opposed by lighted fires, and by the noise and triumphant shouts of the hunters. As they must remain some time in this enclosure, care is always taken to have part of the ditch filled with water, which is supplied by a small stream, either natural or conducted through an artificial channel from some neighbouring reservoir. The elephants have recourse to this water to quench their thirst and cool themselves after their fatigues, by sucking the water into their trunks, and then squirting it over every part of their bodies. While they remain in this enclosure, they continue sulky, and seem to meditate their escape, but the hunters build huts and form an encampment, as it were, around them, close to the palisade; watchmen are placed, and every precaution used, to prevent their breaking through. This they would soon effect, if left to themselves, notwithstanding the palisade is made of very strong stakes sunk into the earth on the outside

ſide of the ditch, and ſtrengthened by croſs bars and buttreſſes as already mentioned.

When the herd has continued a few days in the *Keddah*, the door of the *Roomee* is opened, into which ſome one of the elephants is enticed to enter, by having food thrown firſt before, and then gradually further on into the paſſage, till the elephant has advanced far enough to admit of the gates being ſhut. Above this wicker gate, or door, two men are ſtationed on a ſmall ſcaffold, who throw down the food. When the elephant has paſſed beyond the door, they give the ſignal to a man who, from without, ſhuts it by pulling a ſtring, and they ſecure it by throwing two bars that ſtood perpendicular on each ſide, the one acroſs the other thus ×, forming the figure of St. ANDREW's Croſs, and then two ſimilar bars are thrown acroſs each other behind the door next to the *Keddah*, ſo that the door is in the centre: for farther ſecurity, horizontal bars are puſhed acroſs the *Roomee*, through the openings of the paliſades, both before and behind thoſe croſſes, to prevent the poſſibility of the doors being broken. The *Roomee* is ſo narrow, that a large elephant cannot turn in it, but, as ſoon as he hears the noiſe that is made in ſhutting the gate, he retreats backwards, and endeavours to force it; being now ſecured in the manner already noticed, his efforts are unavailing: finding his retreat thus cut off, he advances and exerts his utmoſt force to break down the bars, which were previouſly put acroſs a little farther on in the outlet, by running againſt them, ſcreaming and roaring, and battering them, like a ram, by repeated blows of his head, retreating and advancing with the utmoſt fury. In his rage, he riſes and leaps upon the bars with his fore-feet, and ſtrives to break them down with his huge weight. In *February*, 1788, a large female elephant dropt down dead in the *Roomee*, from the violent exertions ſhe made. When the elephant is ſomewhat fatigued by theſe exertions, ſtrong ropes *, with running nooſes, are placed in the outlet by the hunters; and as ſoon as he puts a foot within the nooſe, it is immediately drawn tight and faſtened to the paliſades. When all his feet have been made pretty faſt, two men place themſelves behind ſome bars, that run acroſs the *Roomee*, to prevent his kicking them, and with great caution tie his hind-legs together, by paſſing a cord alternately from the one to the other, like the figure 8, and then faſtening theſe turns as above deſcribed. After this, the *Phara*, *Dools*, &c. are put on in ſucceſſion, in the ſame manner as on the *Goondah*, only that here the people are in greater ſecurity. While theſe ropes are making

* Theſe are of the ſame form and ſize nearly as the *Phands*, but much ſhorter in proportion.

making faſt, the other hunters are careful not to go too near, but keep on the outſide of the paliſade, and divert his attention as much as they can, from thoſe employed in faſtening them, by ſupplying him with graſs, and ſometimes with plantain leaves and ſugar canes, of which he is remarkably fond, by preſenting a ſtick, giving him hopes of catching it, or by gently ſtriking or tickling his proboſcis. He frequently, however, ſeizes the ropes with his trunk, and endeavours to break them, particularly thoſe with which his feet are tied, and ſometimes tries to bite them through with his grinders (as he has no inciſors or front teeth), but the hunters then goad him with ſharpened bamboos, or light ſpears, ſo as to make him quit his hold. Thoſe who are employed in putting the ropes around his body, and over his head, ſtand above him, on a ſmall kind of platform, conſiſting of a few bars run acroſs through the openings of the paliſades, and, as an elephant cannot ſee any thing that is above, and rather behind his head, they are very little incommoded by him, although he appears to ſmell them, and endeavours to catch them with his trunk. When the whole apparatus is properly ſecured, the ends of the two cables *(Dools)* which were faſtened round his neck, are brought forward to the end of the *Roomee*, where two female elephants are waiting; and to them theſe cables are made faſt. When every thing is ready, the door, at the end of the outlet, is opened, the croſs bars are removed, and the paſſage left clear. The ropes, that tied his legs to the paliſades, are looſened, and, if he does not advance readily, they goad him with long poles ſharpened at the ends or pointed with iron, and urge him on with their noiſe and din, and, at the ſame time, the females pull him gently forward: as ſoon as he has cleared the *Roomee*, his conductors ſeparate, ſo that if he attempts to go to one ſide, he is prevented by the elephant, that pulls in the oppoſite direction, and *vice verſa*. The *Bundahs*, which tie his hind legs, though but looſely, yet prevent his going faſt; and, thus ſituated, he is conducted like an enraged bull, that has a cord faſtened to his horns on each ſide, ſo that he cannot turn either to the right or left to avenge himſelf. In like manner is this noble animal led to the next tree, as the *Goondahs*, before mentioned, were. Sometimes he becomes obſtinate, and will not advance; in which caſe, while one of his conductors draws him forward, the other comes behind and puſhes him on: ſhould he lie down, ſhe puts her ſnout under and raiſes him up, ſupporting him on her knee, and with her head puſhing him forward with all her ſtrength, the hunters likewiſe aſſiſt by goading him, and urging him forward by their noiſe and din: ſometimes they are even obliged to put lighted torches near, in order to make him advance. In conducting ſmall elephants

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from the *Roomee*, only one cable and one *Koomkee* are made uſe of. As ſoon as each elephant is ſecured, he is left in charge to the *Mahote*, or keeper, who is appointed to attend and inſtruct him; and, under him, there are from two to five *Coolies*, according to the ſize of the elephant, in order to aſſiſt and to ſupply food and water, till he becomes ſo tractable as to bring the former himſelf. Theſe people erect a ſmall hut immediately before him, where the *Mahote*, or one of the *Coolies*, conſtantly attends, ſupplies him with food, and ſoothes and careſſes him by a variety of little arts. Sometimes the *Mahote* threatens and even goads him with a long ſtick pointed with iron, but more generally coaxes and flatters him, ſcratching his head and trunk with a long bamboo, ſplit at one end into many pieces, and driving away the flies from any ſores occaſioned by the hurts and bruiſes he got by his efforts to eſcape from the *Roomee*. This animal's ſkin is ſoft, conſidering his great ſize, and is extremely ſenſible, is eaſily cut or pierced, more ſo than the ſkin of moſt large quadrupeds. The *Mahote* likewiſe keeps him cool, by ſquirting water all over him, and ſtanding without the reach of his trunk; in a few days, he advances cautiouſly to his ſide, and ſtrokes and pats him with his hand, ſpeaking to him all the while in a ſoothing tone of voice, and, in a little time, he begins to know his keeper and obey his commands. By degrees, the *Mahote* becomes familiar to him, and at length gets upon his back from one of the tame elephants, and, as the animal becomes more tractable, he advances gradually forward, towards his head, till at laſt he is permitted to ſeat himſelf on his neck, from which place he afterwards regulates and directs all his motions. While they are training in this manner, the tame elephants lead out the others in turn, for the ſake of exerciſe, and likewiſe to eaſe their legs from the cords with which they are tied, and which are apt to gall them moſt terribly, unleſs they are regularly ſlacked and ſhifted. In five or ſix weeks the elephant becomes obedient to his keeper, his fetters are taken off by degrees, and generally, in about five or ſix months, he ſuffers himſelf to be conducted by the *Mahote* from one place to another: care, however, is always taken not to let him approach his former haunts, leſt a recollection of the freedom he there enjoyed ſhould induce him again to recover his liberty. This obedience to his conducter ſeems to proceed partly from a ſenſe of generoſity, as it is, in ſome meaſure, voluntary; for, whenever an elephant takes fright, or is determined to run away, all the exertions of the *Mahote* cannot prevent him, even by beating or digging the pointed iron hook into his head, with which he directs him; on ſuch an occaſion the animal totally diſregards theſe feeble efforts,

efforts, otherwiſe he could ſhake or pull him off with his trunk, and daſh him in pieces. Accidents of this kind happen almoſt every year, eſpeciclly to thoſe *Mahotes* who attend the large *Goondahs*, but ſuch accidents are in general owing entirely to their own careleſſneſs and neglect. It is neceſſary to treat the males with much greater ſeverity than the females, to keep them in awe; but it is too common a practice among the *Mahotes*, either to be negligent in uſing proper meaſures to render their elephants docile, or to truſt too much to their good nature, before they are thoroughly acquainted with their diſpoſitions. The iron-hook, with which they direct them, is pretty heavy, about ſixteen inches long, with a ſtraight ſpike advancing a little beyond the curve of the hook, ſo that altogether it is exactly like that which ferrymen or boatmen uſe faſtened to a long pole.

In this account of the proceſs for catching and taming elephants, I have uſed the maſculine gender, to avoid circumlocution, as both males and females are treated in the ſame manner: the former are ſeldom ſo docile, but, like the males of other animals, are fiercer, ſtronger, and more untractable than the females.

Before I conclude, it may be proper to obſerve, that young elephants ſuck conſtantly with their mouths, and never with their trunks, as BUFFON has aſſerted: a concluſion he made merely from conjecture, and the great and various uſes to which they are well adapted and applied, by every elephant.

I have ſeen young ones, from one day to three years old, ſucking their dams, but never ſaw them uſe their trunks, except to preſs the breaſt, which, by natural inſtinct, they ſeemed to know would make the milk flow more readily. The mode of connection between the male and female is now aſcertained beyond the poſſibility of a doubt; as Mr. BULLER, Lieu. HAWKINS, and many others, ſaw a male copulate with a female, after they were ſecured in the *Keddah*, in a manner exactly ſimilar to the conjunction of the horſe with a mare.

This fact entirely overturns what has been ſo often related, concerning the ſuppoſed delicacy of this uſeful animal, and a variety of other hypotheſes, which are equally void of foundation. As far as I know, the exact time an elephant goes with young, has not yet been aſcertained, but which cannot be leſs than two years, as one of the elephants brought forth a young one twenty-one months and three days after ſhe was taken. She was obſerved to be with young in *April* or *May*, 1788, and ſhe was only taken in *January* preceding; ſo that it is very likely ſhe muſt have had connection with the male ſome months before ſhe was ſecured, otherwiſe they could not diſcover that ſhe was with young, as a fœtus of leſs than

ſix

ſix months cannot well be ſuppoſed to make any alteration in the ſize or ſhape of ſo large an animal. The young one, a male, was produced *October* 16th, 1789, and appeared in every reſpect to have arrived at its full time. Mr. HARRIS, to whom it belongs, examined its mouth a few days after it was brought forth, and found that one of its grinders on each ſide had partly cut the gum. It is now alive and well, and begins to chew a little graſs.

I have further to remark, that one of the tuſks of the young elephant has made its appearance, ſo that we can now aſcertain it to be of that ſpecies called *Mucknah*, the tuſks of which are always ſmall, and point nearly ſtraight downwards. He was thirty-five inches high, at his birth, and is now thirty-nine, ſo that he has grown four inches in nearly as many months. Elephants are always meaſured at the ſhoulder; for the arch or curve of the back, of young ones particularly, is conſiderably higher than any other part, and it is a ſure ſign of old age, whenever this curve is found flattened or conſiderably depreſſed, after an elephant has once attained his full growth.

Though theſe remarks, as well as ſeveral others in the above relation, do not come within the plan I propoſed, which was merely to deſcribe the method of taking wild elephants in the province of *Tipura*, yet I hope they will not be deemed impertinent or ſuperfluous, eſpecially as ſeveral of them tend to eſtabliſh ſome important facts in the natural hiſtory of this animal, that are not known or not attended to, at leaſt in any accounts that I had an opportunity of ſeeing.

EXPLANATION *of ſeveral words uſed by the natives who catch elephants.*

Bundah—a middle-ſized cord, ſix or eight cubits long, which is put round either the hind or fore legs of elephants, in order to ſecure them. From ten to twenty are employed.

Chilkáh—is a very ſlight ſoft cord, which the hunters at firſt put around the hind-legs of a *Goondah*, before they begin to tie him: this is not uſed for *Keddah* elephants.

Dáugbearee—is generally a continuation of every ſecond *Bundah* that is put on, a few turns of which are paſſed round, where the folds of the *Bundahs* interſect each other, in order to faſten and keep them firm. When the *Bundah* is not long enough, another cord is made uſe of.

Dooblah—is that rope which is made faſt on one ſide to the aftermoſt *Pharah*, then

then carried under the tail and faſtened to both the *Pharahs* on the oppoſite ſide, ſo as to anſwer the purpoſe of a crupper, and to keep the *Pharahs* in their places.

Dool—is a large cable, about ſixty cubits long, with a running nooſe. Two of them are put round the neck of the elephant, and faſtened to the foremoſt *Phara* or girth, one on each ſide, in ſuch a manner, as to prevent the nooſes from being drawn too tight or coming too far forward, and this is effectually done by the *Dooblah*; for whenever the elephant draws back, the *Dools* pull the crupper forward, which muſt gall him very much, and prevent him from uſing all the force he might otherwiſe exert in order to free himſelf.

Phand—is a cable nearly the ſame ſize as the *Dool*, the nooſe of which is put round each leg of the *Goondahs*, and then it is tied to trees or ſtakes. The *Phands*, uſed for the *Keddah* elephants, are only about thirty cubits long.

Phárah—a rope that is put round the body of an elephant, like a girth, and to which the *Dooblah* and *Dools are connected.*

Tooman—is the rope that is paſſed round the buttocks of an elephant, and prevents his ſtepping out freely: it is faſtened to the girth and crupper, that it may not ſlip down.

*Tipura**, *March* 29th, 1790.

THE PLAN OF A COMMONPLACE-BOOK.

By J. HARINGTON, *Eſq.*

MR. *Locke* eſteemed his method of a commonplace-book "ſo mean a thing, as "not to deſerve publiſhing in an age full of uſeful inventions," but was induced to make it publick at the requeſt of a friend. This perhaps ſhould have deterred me from offering a paper of the ſame denomination, to a ſociety inſtituted for enquiring into the more eſſential parts of literature; yet, ſince Mr. *Locke* bears teſtimony to the utility of his method, after five-and-twenty years' experience, and ſince whatever may tend to aſſiſt the acquiſition of knowledge, cannot, I conceive, be deemed

* The ancient name of the province was *Tripura*, or *with three towns*, which has been corrupted into *Tipra* or *Tipara*.

undeſerving

undeferving of attention, I venture to fubmit the plan of a commonplace-book, which has occurred to me, founded on Mr. *Locke*'s, but calculated, I think, to obviate an inconvenience to which his is fubject.

On confidering the method defcribed and recommended by Mr. *Locke*, it appeared to me that the number of words, having the fame initial letters and following vowels, might frequently make it tedious to find a particular head, if noted in the index by a numerical reference to the page only; and that the fame caufe might render it difficult to afcertain whether any particular head had been entered. For inftance, *balm*, *bark*, *bard*, *bat*, *baron*, having, with numerous other words, the fame initial letter and fucceeding vowel, feveral references to the pages pointed out by Mr. *Locke*'s numerical index might be neceffary, before any one of them, in particular, could be found; or before it could be afcertained, whether any one of them had been previoufly entered in the book. An index, of which the following is a fpecimen, would, it is prefumed, remedy thefe apparent difadvantages. *How* far it is free from others, will be known from experience.

A fhort explanation of the method adopted for this book will be fufficient. One-and-twenty pages, divided each into five columns, and fubdivided in the feveral columns for the number of the folios, the letters of the alphabet written at the head of each page, and the five vowels inferted in the columns under each letter, will form a fufficient index, provided the letters J, Q, V, X, and Z, inftead of having diftinct pages appropriated to them, be written in the fame pages with I, P, U, W, and Y, which they may be without inconvenience.

The *Index*, thus prepared, is ready to receive the heads of whatever fubjects may be entered in the book under their correfponding initial letters and following vowels, or under their initial letters and fimilar vowels, when the head is a monofyllable and begins with a vowel. It is hardly neceffary to repeat Mr. *Locke*'s remark, that "every head ought to be fome important and effential word or term." If a fmall margin be left in each folio of the book, and the indicative word or head be written on it, it will be confpicuous, although feveral heads fhould be included in the fame folio; but, until it become neceffary, from there being no remaining folios wholly blank, it is advifeable to appropriate a feparate folio to each head, as, by this means, the feveral fubjects entered are kept more diftinct, and any additions may be made to the fame head, without the trouble of reference to other folios; for which purpofes it is alfo advantageous to place the folio-numbers on the left pages only, leaving the right-hand pages for a continuation of the fubjects entered on the left, or for remarks

marks thereon, until it become neceſſary to appropriate them to new heads, in order to fill the book.

To theſe remarks, which may appear more than adequate to the occaſion, it will be ſufficient to add, that, if the heads in the index ſwell, under any letter, beyond the dimenſions of the ſingle page aſſigned to them (which however in a book of moderate ſize is not probable) they may be continued on a ſecond page, to be prepared for the ſame letter, at the end of the original index, for which purpoſe ten or twelve blank leaves may be left between the index and the commencement of the book: and laſtly, that if the entries in the book, under any head, fill more than the two pages firſt appropriated to it, the ſame head may be continued in any ſubſequent blank folio, by obvious notes of reference, at the foot of the former and top of the latter, without any new entry in the index, which would then be unneceſſarily filled.

The *Aſiatick* Society was inſtituted for enquiring into the antiquities, arts, ſciences, and literature of *Aſia*; and the humble plan of a commonplace-book cannot claim admiſſion among any one of theſe objects: it may however be conſidered as connected with all, ſince it may aſſiſt enquiries concerning the whole of them. If it be aſked, whether ſuch a plan be within the local limits of this ſociety, it may be anſwered, that it is, in its nature, univerſal; but if any particular plan be deſigned in *Aſia*, ſuch plan may, with propriety, be tendered to the *Aſiatick* Society, for the benefit either of publication in their Tranſactions, if deemed worthy of it, or of ſuppreſſion, for the author's ſake, if deemed uſeleſs. A ſimilar index with thirty pages and ten columns, according to the number of the *Nagari*-conſonants and vowels, which are moſtly in uſe, would ſuit a commonplace-book intended to compriſe the whole extent of *Aſiatick* literature.

Each of the figures A, B, C, muſt be conſidered as repreſenting a large folio page; and it ſeemed unneceſſary to exhibit the ſpecimen, on a more extenſive ſcale: the numbers of the *folios* are ſuppoſed to be thoſe of the commonplace-book. The names *Arabia, Bahmen, Campilla*, and the reſt, are given by way of example, but were not ſet down with any particular ſelection.

A.

a	*fol.*	e	*fol.*	i	*fol.*	o	*fol.*	u	*fol.*
Arabia.	256	*Ahremen.*	256	*Ahilya.*	255	*Aſoca.*	254	*Aguru.*	256

B.

a	*fol.*	e	*fol.*	i	*fol.*	o	*fol.*	u	*fol.*
Bahmen.	255	*Beli.*	255	*Bilva.*	256	*Borax.*	255	*Bhuchampac.*	254

C.

a	*fol.*	e	*fol.*	i	*fol.*	o	*fol.*	u	*fol.*
Campilla.	255	*Ceſari.*	255	*Criſhna.*	254	*Chorapuſhti.*	255	*Cuſha.*	255

Aſoca: This is the true name of a charming tree, inaccurately named *Aſjogam* in the *Hort. Malab.* vol. 5. tab. 59. It is a plant of the *eighth* claſs and *firſt* order, bearing flowers of exquiſite beauty; and its fruit, which *Van Rheede* had not ſeen, is a *legume*, compreſſed, incurved, long pointed, with ſix, ſeven, or eight ſeeds: it will be deſcribed very fully in a paper intended for the Society. The *Brahmens*, who adore beautiful objects, have conſecrated the lovely *Aſoca:* they plant it near the temples of *Siva*, and frequently mention a grove of it, in which *Ravan* confined the unfortunate *Sita*. The *eighth* day from the new moon of *Chaitra* incluſive, is called *Aſocaſhtami*.

Criſhna: Properly *black* or *dark blue*, an epithet of the *Hindu* God, whoſe youthful

ful exploits resemble those of *Apollo Nomius:* he was particularly worshipped by the *Surasena*, or people of *Matthura:* and *Arrian* says, that the *Suraseni* adored *Hercules*; but the deity whom he means, was *Hercules Musagetes*, or *Gopinat'ha*, who was the patron of science, according to Mr. *Bryant*, or the 'God of Eloquence, with the Muses in his train.' See *Anal. Anc. Mythol.* vol. 2. p. 74. The *Gopyah* were the patronesses of musick and poetry.

Bhuchampac: So the *Hindus* call a beautiful plant described by *Rheede*, and admitted by *Linnæus*, under the names of *Kæmpferia rotunda.* The *Indian* appellation is very improper, as the flower has no resemblance to the *Champac*, except in the richness of its odour. *Bhu* means *ground*, from which the blossoms rise with a short scape, and scarce live a whole day.

Cesari: A lion in *Sanscrit*, so named from his mane: *Cesa* and *Cesara* signify *hair.* Etymologists will decide whether *Cæsaries* and *Cæsar* had an affinity with those *Indian* words.

Ahilya: The celebrated consort of an old *Indian* sage, named *Gotama:* hence it is the name of a rich *Mahratta* lady, who employs her wealth in works of devotion at *Benares* and *Gaya*, as well as in her own country.

Borax: A corruption of the *Arabick* word *burak*, or *brilliant.* It is found in its native state, both in *Tibet*, according to *Giorgi*, and in *Nepal*, according to Father *Giuseppe*.

Cusha: Pronounced more correctly *Cusa*, with a palatial *s*; a grass held sacred by the *Brahmens*, from time immemorial. It is the *Poa Cynosuroides* of Dr. *Koenig*.

Beli: The *Belus*, probably of the *Greeks*; for though *bal* signifies lord, in most eastern dialects, yet in *Chaldaic*, according to *Selden*, it was written *Bel*, exactly as the name of the *Hindu* monarch is vulgarly pronounced.

Chorapushpi: Or *Thief-flowered*; the corymbed *Scirpus* with awled spikes, so troublesome in our *Indian* walks.

Campilla: Commonly called *Camala-guri*, a plant used by dyers, of a new genus; described by Dr. *Roxburgh*.

Bahmen: An old *Persian* month and the genius presiding over it: the name also of a celebrated king and hero.

Bilva: The *Cratæva Marmelos*, but certainly misplaced in *Linnæus*; its fruit has lately been found very beneficial in diarrhœas.

Ahremen:


MISRA-STHAN
OR
GUPTA-STHAN.
Atavi
& Arunya
Forests
Bhav Atavi
Racas-sthan
Padma Pyramid
Cama Foreft
Bhava sthan
Arki or Sari sthan'
Dardanasa-sthan'
Tapan'-sthán'
Rahu-sthán'
MISRA-STHAN
The 3 Mountains or Rukma-vatsa
Laya sthán
MISRA STHAN
Ashru
Lake
Atavi Devi's Pyramid
and FORESTS of
Thorny Trees
Carddama-sthan
FORESTS
Pani-graha
Pyramid of Ashtára Devi
Gupta-sthan
CARDDAMA-STHALI
Piti sthan or Piti rishi-sthan
Ashvini Devi sthan
Pyramid of Trita Devi
TAPA
Aurwa sthan
The Course of the
RIVER CALI'
or
GREAT KRISHNA'
through
Cusha-Dwip without,
and
Shankha-Dwip proper:
from the
PURANS.
SHANKH' ODADHI
Sea of Amagna
Sirbon's Lake
Misra-sthan
Ashru L.
SHYAMA MUKHA'S
CUTILA KE'SA'S
Cali R.
Carddamá sthali
Hema-Cutha
Barbara sthan
Gold Mountains
TAMOVANSA'S
SHANKHA ODADHI
Mocshésha
Shankha Puri
Cusha-dwip. within........Green
Cusha-dwip. without......Yellow
Shankha-dwip. proper......Red
Names of places written thus, Raptum Pr. are from the ancient Geographers. &c.
BARBARA-DÉSA
Puñya vati or Meroa
Atri
Subhavati'-Sabha'
Palli
YARAVA
YATUS
Pushpa varsha-sthan
NISHADHA Mountains
Pari-bhadra
NISHADHA
PALLI'S
Padma-wan
STHA'N'
SHARMA-STHA'N
Equator
RED SEA
Amibi, now Pemba
The two Menan I.s
Myrriaca I.
Harbour of Rapta
Raptum Pr.
Lake of Amara or of the Gods
PULANDAS
Mountains of Ajagara
CHADAPS
Rupa-vati or Rupavati Rapta Metropolis
Mt. of Soma, or of the Moon
The Columns of Ephorus
Prasum Pr. or B. Cape from Prachi
Cerne, orientalis
ARUN' ODADHI
Scales.
100 G. Yojans
100 Cos Astronom.
194 British Miles
Mutlow, fc Russel Court

RAMA

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